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ROCKS and MINERALS

Vol. 6. No. 3. SEPTEMBER, 1931 Whole No. 21

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Mont Pelee, Martinique, West Indies.

5th ANNIVERSARY NUMBER

A NON-TECHNICAL MAGAZINE
—ON—
MINING - PROSPECTING - GEOLOGY - MINERALOGY

THE BULLETIN BOARD

A SPECIAL MESSAGE TO YOU!

Please read the announcement on page 2

The Editor of ROCKS AND MINERALS would greatly appreciate it if each of his subscribers and friends will send a postal card pledging his interest in the voting contest for a National rock and mineral—this interest to be manifested by urging boy and girl scout organizations, mineral clubs, high school students, and others in his community, to have a part in the voting contest. Notices in the local press calling attention to this vote will also be appreciated if within the subscriber's influence to obtain free reading notice of it. Remember that such a contest as this can in no wise be considered successful unless an unusually large number of votes is cast.

Special ballots have been printed and subscribers may obtain any number for distribution by sending stamps to defray postage. This will be their financial support of the contest.

Your special effort and your pledge will be gratefully appreciated by the Editor of ROCKS AND MINERALS.

COMING

The Preparation of Micro-Mounts

By L. C. WILLS, M. D.

The most complete article known on the preparation and study of micro-mounts, a subject of intense interest to many collectors, will appear in the December issue of ROCKS AND MINERALS. Dr. Wills, a noted authority on the subject, has done considerable research work and experimenting in the field of micro-mounts and the article has been prepared with the object of giving others the benefit of his own conclusions. We are very sure a large number of collectors will be added to the ranks of micro-mount enthusiasts after reading this interesting article.

ROCKS AND MINERALS is most fortunate in having the privilege of printing in the December issue this valuable contribution to mineralogy.

In Memoriam

The following friends of ROCKS AND MINERALS have left this earth on the long journey to that far distant country from which no traveler returns. May their journey thither be from one blessing to another and their arrival be marked by the rich rewards vouchsafed those who live this earthly life well and in the fear of God.

Rev. Math. Wernerus, Potosi, Wisc.

Miss H. J. Cook, Hedley, B. C., Canada.

T. Arthur Smith of Washington, D. C., died suddenly Aug. 5th of heart disease.

WANTED: Correspondents in all parts of the world who will be kind enough to send us notes and news items on minerals, etc., that they think may be interesting to the subscribers of ROCKS AND MINERALS. Such as are available we shall be very glad to print in the magazine.

ROCKS and MINERALS

A NON-TECHNICAL MAGAZINE

—ON—

MINING—PROSPECTING—GEOLOGY—MINERALOGY

Published Quarterly

Founded 1926

Vol. 6 No. 3

Whole No. 21

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Entered as second-class matter September 13, 1926, at the Post Office at Peekskill, N. Y., under the Act of March 3, 1879

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Specially written articles (as Contributions) are desired.

Subscription price $1.00 a year; foreign $1.25. Current numbers, 35c a copy; back number, 40c a copy. No responsibility is assumed for subscriptions paid to agents, and it is best to remit directly to the Publisher.

Issued on the 1st day of March, June, September and December. Forms close on the 20th of January, April, July and October.

Authors alone are responsible for statements made and opinions expressed in their respective articles.

ROCKS AND MINERALS PEEKSKILL, N. Y., U. S. A.

The Official Journal of the Rocks and Minerals Association

What Shall Be Our National Rock and Mineral?

ROCKS and MINERALS Magazine is Preparing to Take a Vote Upon the Question

While America has selected the American Eagle, the most regal of the species, as a bird typifying America, placing its image upon its coat of arms, associating it with the Star Spangled Banner and impressing it upon its gold and subsidiary coin; and while the American people have selected a flower—the Wild Rose—which of all the flowers that are native to American soil most truly in their minds typifies or symbolizes America, we have no rock or no mineral that has been selected as characteristic of American mountains and American soil.

ROCKS AND MINERALS is going to take a vote of as many American people as it can interest as to what rock and what mineral would be most symbolic of the United States.

In the choice of a rock and mineral, the opinion of the Editor of ROCKS AND MINERALS is that due regard should be had for their general distribution, their general usefulness in American trade and arts, and their value in American commerce. As an illustration, garnet is widely distributed. It is found associated with many kinds of rocks and minerals; often it is valueless because present in small quantities; again when it occurs massive it has value as an abrasive material; it varies in color from white through yellow, brown, red, green to black; and in its most perfect form it can be cut as a jewel.

The Editor, in his correspondence with a large number of eminent mineralogists, geologists, and friends, finds that the idea of a National rock and a National mineral appeals to practically all of them. Some have been so kind as to suggest certain rocks and minerals which should be placed upon the ballot.

Dr. Henry C. Dake, Portland, Oregon, President of the Rocks and Minerals Association, and representing the Northwest section of the United States, selects granite and hematite to go upon the ballot; John A. Renshaw, Arcadia, California, President of the Southern California Mineralogical Society, and representing the Southwest section of the United States, nominates granite and gold; Noyes B. Livingston, Fort Worth, Texas, an officer in the Rocks and Minerals Association and representing the South, suggests granite and gold, Frederick Shepherd, Chicago, Ill., (Department of Geology, Northwestern University,) and representing the North, names granite and quartz as his favorites; H. M. W. Haven, Portland, Maine, President of the Maine Mineralogical and Geological Society, and representing the Northeast, mentions as worthy candidates granite and gold; J. H. Howard, Greenville, S. C., and representing the Southeast, puts forward granite and gold, as worthy of national honors; Dr. Bertha Chapman Cady, New York, N. Y., an officer in the Rocks and Minerals Association, and representing the Girl Scouts, urges gneiss and quartz as her choice; Charles W. Hoadley, Englewood, N. J., an officer of the Rocks and Minerals Association, intimates that no rock and mineral is more worthy than granite and garnet. Others have assured the Editor of their interest and support.

All this has determined the Editor to submit the question to a popular vote. Ballots are being printed and will be distributed as widely as possible throughout the United States. Everyone who receives or can secure a ballot will be privileged to cast a vote whether he or she is a subscriber to the magazine or not, an adult, a college or a high school student. The larger the vote the more nearly we shall come to determining which rock and which mineral have characters inherent in them which would make them worthy of being chosen as National and symbolic of American industry, art, and commerce.

It is not intended to limit a voter to the names of rocks and minerals which appear upon the ballot. A person can reject all names appearing thereon and write in those of his own selection. It might be said, however, that most of the names of the rocks and minerals appearing upon the ballot are those which have received a majority in the nominations sent in to the Editor by his mineralogical friends and acquaintances.

It is the hope of the Editor that all

subscribers to ROCKS AND MINERALS will evince a special interest in the vote to be taken, that they will be willing to distribute ballots among their friends, interest clubs, and social groups in their communities and arouse an interest in this contest among the students in their high schools. Let us make this one of the largest and most notable voting contests that has ever been held and let us all, with the utmost seriousness, give careful thought to the selection of the right rock and the right mineral to be accorded national honors.

(To be detached along line)

ROCK AND MINERAL VOTE

MY CHOICE

For a National Rock and a National Mineral Typical of the United States

Most of the names printed below have been selected by well-known geologists and mineralogists. Make a mark in the square at the left indicating your choice. If, however, the rock and mineral you would choose is not printed on the ballot, write in the names of those you would accord national honors.

ROCKS AND MINERALS will announce date Contest closes in its September, 1932 issue.

Vote for ONE rock and ONE mineral

	ROCKS		MINERALS
	Granite		Hematite
	Gneiss		Gold
	Marble		Garnet
	Limestone		Quartz
	Sandstone		Pyrite
	Schist		Calcite
	Slate		Limonite
	Coal		Mica
	Serpentine		Chalcopyrite
	Shale		Sphalerite
	Conglomerate		Galena

Mail to Editor, National Rock and Mineral Contest,
ROCKS AND MINERALS Magazine, Peekskill, N. Y.

Name of Voter .....

City and State .....

(See Bulletin Board for Special Announcement)

ROCKS AND MINERALS MONTHLY FUND

Founded by William C. McKinley of Peoria, Illinois

As soon as $5,000 has been contributed ROCKS AND MINERALS *will come out monthly without any increase in subscription rates.*

Those who have been contributing to the Monthly Fund, to have the magazine come out as a monthly, will be gratified to know that the Fund is growing. A separate account is kept in the bank of this Fund and interest is paid upon the balances.

Besides a few larger gifts, the Fund has added to through those who have written the Editor for information, and enclosed a small Honorarium for the trouble they were putting him to, and by others, who in ordering books or minerals, or in renewing subscriptions, have added an extra amount to their check with requests to place this extra amount to the Fund.

We hope the Fund may eventually reach the $5,000 necessary to make the magazine a monthly, when we will try the further experiment of issuing ROCKS AND MINERALS each month.

Contributions received to July 20, 1931:—

James G. Manchester, Scarsdale, New York	$ 50.00
The Gem Shop, Wolf Creek, Montana	25.00
Ernest M. Skea, Pilgrims Rest, South Africa	20.00
Fred W. Schmeltz, New York, N. Y.	20.00
Anonymous	11.60
Ramon Conover, Kyserike, New York	10.00
An interested friend, Peekskill, New York	10.00
WILLIAM C. McKINLEY, PEORIA, ILLINOIS	5.00
Capt. T. L. H. Shone, Postmasburg, South Africa	5.00
A Friend in Maryland	5.00
J. D. Howard, Klamath Falls, Oregon	3.00
R. L. Phillips, Brazil, Indiana	1.00
Geo. W. Swager, Sulphur, Nevada	1.00
Interest	.09
Total	$166.69

THE EDITOR ASKS A FAVOR

The Editor is making a special study of molybdenite and its occurrences and would be pleased to have the co-operation of the readers of ROCKS AND MINERALS that his investigations may be a success. Notes on occurrences of molybdenite personally known to readers are especially wanted and these should cover as many of the following points as possible:

1—Mode of occurrence (crystals, plates, disseminated, etc) and its associated minerals and type of rock in which found.

2—Locality— and if found in a mine or quarry what is the mine or quarry worked for.

3—Is the molybdenite a primary or secondary mineral?

4—Photograph of the occurrence if possible and a little sketch map showing location of occurrence and how it may be reached.

5—A sample of the mineral would be appreciated.

We hope to publish a pamphlet, after investigations are completed, covering molybdenite occurrences in the United States and in as many foreign countries as possible.

ROCKS and MINERALS

Edited and Published by Peter Zodac

PUBLISHED QUARTERLY

SEPTEMBER 1931

Our Fifth Anniversary--A Brief Review

How ROCKS and MINERALS Came Into Existance

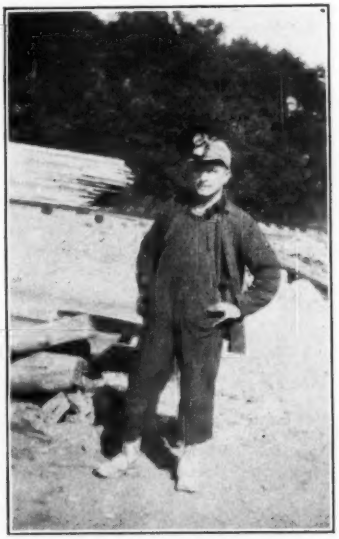
While employed as mining engineer in the anthracite coal mines of Pennsylvania and the iron ore mines of New York and New Jersey and coming in contact with miners, engineers, superintendents and others, the future Editor of ROCKS AND MINERALS found that none really knew anything about minerals. Iron ore, if treated in a certain way, would, they knew, yield a valuable metal of commerce called "iron." But the fact that other minerals were associated with the ore and rock in beautiful crystals and graceful clusters—and that imprints of ferns and plants which flourished ages ago were uncovered, was of no interest and they were thrown on the waste banks as accumulations about the veins that were a nuisance and of no value.

During a depression in mining, when the future Editor returned to his native city of Peekskill with a keener interest in minerals than he ever had before, he began dealing in mineral specimens by buying from those who knew minerals and selling to those who knew little about them and soon found that a tradesman succeeds better if he subscribes to the journal of his trade which keeps him in touch with what is new and with what others are doing. He believed a magazine, treating mineralogical subjects in untechnical language, was sadly needed by the collector, the mineralogist, and the dealer. We say untechnical language. There had been and there are magazines published on mineralogy but they were and are intended for the advanced mineralogist.

So the future Editor determined, without financial backing and with small financial resources of his own, to issue a magazine that would be thoroughly understood by the beginner and of interest to the professional mineralogist. His friends counseled him against any such attempt, stating it would not succeed and that he would lose money. He has lost money, true enough, but he also believes that the magazine has been eminently successful, at least many whose opinion is worth having have been kind enough to tell him so.

It has been interesting to the Editor on looking back over the past five years of publication to note the source whence has come the success of the magazine from the point of a long subscription list.

In the early days when the magazine sold for 50c the subscribers largely were



When the Editor was a miner. (Mining Engineer at the Sterling Iron Mines, Orange County, N. Y. 1920.)

collectors and members of mineralogical societies; as time passed and subscriptions had to be renewed many of these subscribers deserted us. When the price of the magazine was increased to $1, still more fell away. But with the ever increasing improvement of the magazine, as experience came to the Editor and friends arose here and there who aided us with fine contributions in the way of manuscripts, a new class of subscribers was attracted to ROCKS AND MINERALS These were those who were not perhaps collectors but who were sufficiently interested in the rocks and stones about them to want to know something about mineralogy and it is these readers, reinforced of course by members of mineralogical clubs and by many prominent and well-known mineralogists in this and other countries, who believed in us and believed the magazine can do much to awaken an interest in the mineralogical world, who are the ones today making the success of ROCKS AND MINERALS not only by their renewed subscriptions but by their sympathy with our efforts and their endeavor to increase our subscription list by recommending the magazine to others. It has been surprising that the magazine has not been generally supported by mineralogical clubs and societies. It is to these members we would naturally look as supporters of our endeavor to make the mineralogical field a more popular one for lovers of nature study. We acknowledge our indebtedness to many of these brethren because we have subscribers in most of the mineralogical societies but we think the largest percentage of membership of any club does not exceed 30%. We have wondered at times whether we were not appealing to these members or whether they were merely collectors interested only in the number of specimens they possessed and with as little knowledge of the specimens as the average stamp collector exhibits in his knowledge of the countries represented in his album by their stamp issues. If it is the fault of the magazine we hope we shall yet be able to appeal to the membership of the mineralogical clubs by the articles which will appear in future issues.

To those members of mineral clubs who have remained with us from the beginning, to those who still encourage us and are helpful in our mission of disseminating mineralogical knowledge in an interesting and untechnical form, we wish here to extend our most sincere and appreciative thanks. They have done much to bring about the success of the magazine. Nor should we here neglect to express a very deep appreciation to those who have shown their helpfulness not only in words of encouragement but with subscriptions extending over a period of years. These we feel are indeed our friends and they are very dear to us.

It has been very interesting to the Editor also to note that quite a number of subscribers to ROCKS AND MINERALS are young people who find the magazine of interest. Our youngest subscriber is 9 years old. Some who have started at what might have been considered an early age have become collectors and some of our subscribers may recall the interesting articles written for the magazine by Miss Betty Browne who was then 13 years old.

We feel more and more gratified as the years go by that the magazine is accomplishing the purpose of the Editor when it was first issued, and as the membership of the Rocks and Minerals Assoc-

PETER ZODAC, *Editor*

iation is constantly increasing from month to month, we are certain that the success of the magazine is assured.

But this assurance is based upon the hope that our friends will still continue to assist us in securing subscriptions and advertisements. The more we have of these the better the magazine we can give to you and to our new readers.

As so many kind friends among the subscribers to ROCKS AND MINERALS have asked for the Editor's picture he has finally consented to have it accompany this review.

Igneous Rocks and Associated Mineral Deposits of Southeastern Illinois

—*By*—

DON L. CARROLL

Associate Geologist,
Illinois State Geological Survey

In extreme southeastern Illinois, more specifically in Hardin and Pope counties, the geological conditions are such as to render the district unique for that part of the United States lying east of the Mississippi River. The most striking feature of the area is the great number of faults which criss-cross the country, breaking the stratified rocks of the earth's crust into separate blocks which vary individually in respect to surface area, geometric pattern, attitude of rest and vertical displacement. The remarkable fact about this region is that it is located in the midst of an extensive territory of sedimentary rocks which are comparatively little disturbed from their originally horizontal attitude and are in most places almost free from faults. Yet, in the very heart of this vast domain of almost undisturbed rocks, lies this shattered district—in extreme contrast to the surrounding region. There are but few such occurrences anywhere in the world.

No less extraordinary is the common presence within the region of igneous rocks in the form of dikes, sills and plugs. It is true that igneous intrusions of this type are known to exist in other areas of undisturbed rocks, but they are rare, and they do not compare in number with those of this region. The faults and igneous intrusions of these counties in southeastern Illinois are of more than ordinary interest because of their close association with important fluorspar deposits there.

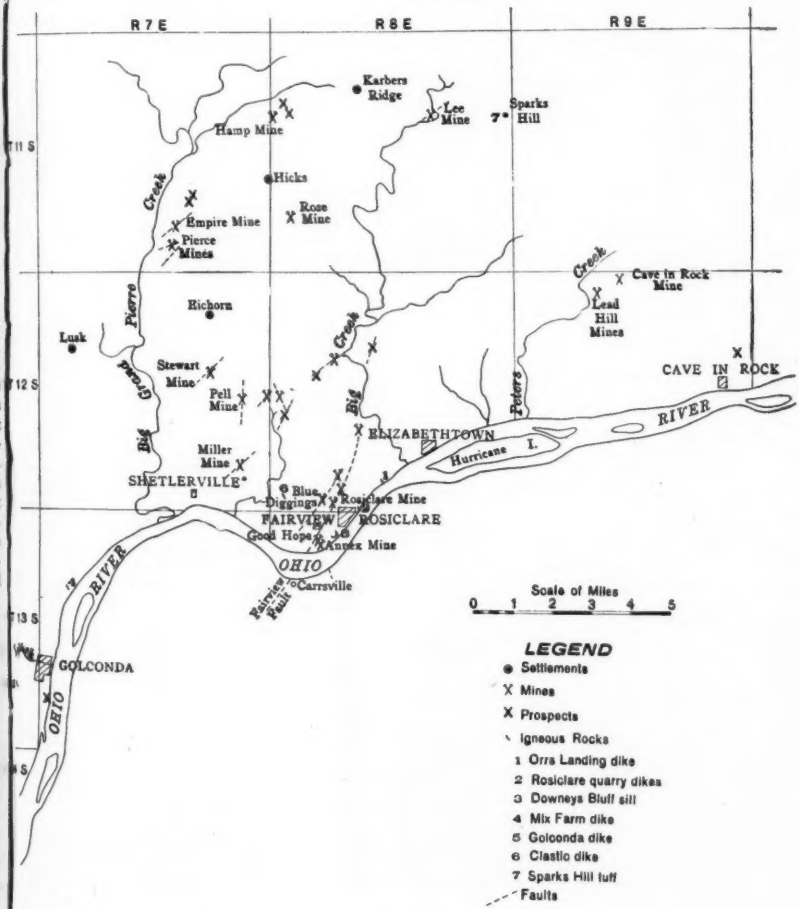
Detailed geologic investigations of the faulted area have established, almost beyond doubt, that it represents a part of a collapsed arch or dome which extended across the Ohio River into Kentucky. The presence of the igneous dikes in the area suggests the probable, or at least the most logical, explanation of the dome structure. All the dikes are similar in character and are undoubtedly connected with a deep-seated igneous intrusion, which at some time in the distant past was injected into the crustal rocks, upwarping the overlying strata. As the rocks were elevated in this manner they were subjected

Block of limestone from river bluff near Rosiclare, Illinois, showing igneous sills injected between stratification planes.

to enormous tensional stresses, which caused them to be fractured along the major lines that we now recognize as faults.

As the fault blocks lie at the present time, most of them have very evidently slipped downward from the positions they once occupied while the dome was still intact. Some of the blocks dropped down as much as 2000 feet or more when the dome collapsed. The most likely explanation for the settling and breaking down of the dome is the assumption that a large amount of the molten material constituting the intrusion was gradually squeezed out, due to the enormously heavy load of the rock formations that made up the roof. There is evidence to prove that this was the case, and that much of the molten material was forced into and between the stratified rocks around the borders of the uplifted mass.

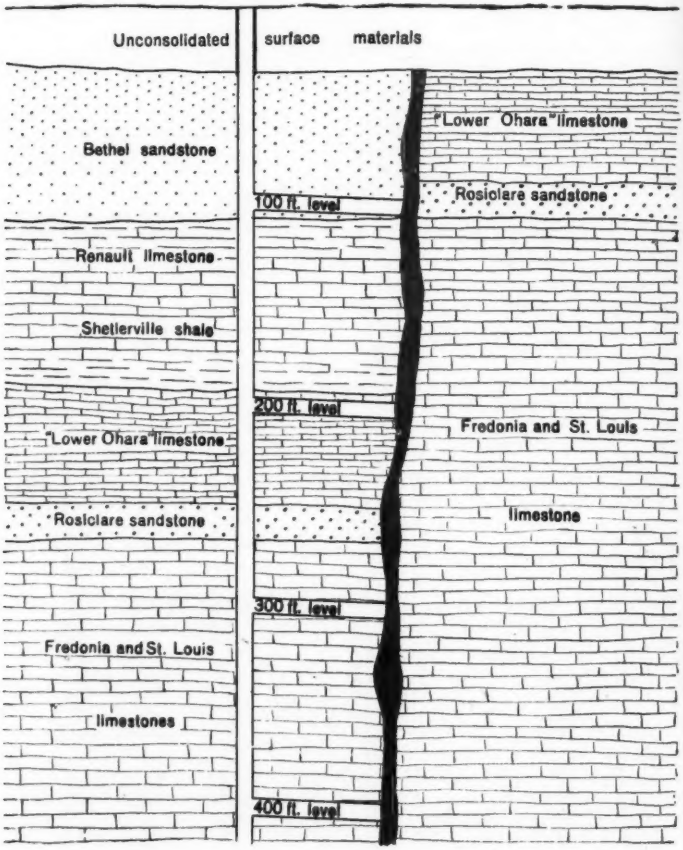
Some of the faults in the region show mineralization at various points along



Sketch map of Illinois fluorspar district.

their courses, and it is probably true that they are mineralized throughout their extent. Other faults show absolutely no evidence of mineralization, and probably are not at all mineralized. This strange situation becomes more understandable when we realize that some of the faults were formed at the time of doming, while the others were the result of the dome's collapse. Since the agents of mineralization are most potent during the early stages of igneous activity, it is undoubtedly true that the earlier faults and fractures were the ones which were most amenable to mineralization.

As stated before, the principal mineral deposits are veins and beds of fluorspar —the largest and most important in the United States. Associated with the fluorspar, however, are variable amounts of silver-bearing galena, sphalerite, calcite, smithsonite, cerrusite, barite, pyrite, chalcopyrite and malachite. The fluorspar occurs in great masses, breaking into angular cleavage pieces upon being mined. Crystals and crystal groups are very

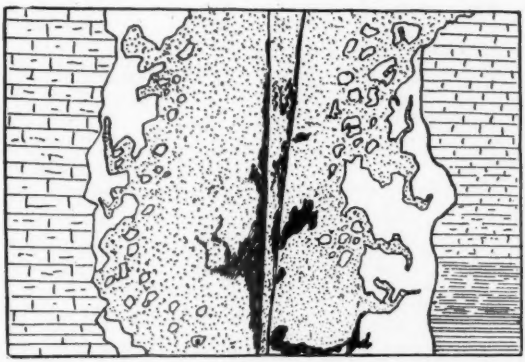


Idealized geologic section of typical Illinois fluorspar mine, showing method of mining, fault displacement, and mineralization along fracture (in black).

View of a mass of fluorspar where a vein outcrops at the surface, in Pope County, Ill.

common. The bulk of the mined product is colorless, white or faintly yellowish, but shades of amber, purple, blue, green and pink are also common. It is most closely associated with white, crystalline calcite, replacing the latter to a great extent. Some of the fluorspar runs as high as 99 per cent or better in relative purity, although the presence of the associated minerals necessitates the milling of the product before shipment.

In places, the fluorspar occurs as flat, tubular masses, between the bedding planes of the sedimentary rock series. In these cases the mineral has replaced limestone as a result of favorable conditions.



Vertical section of a fluorspar vein, showing relations with wall rock. Calcite shown in white; fluorspar in stippling; sulphides in black.

Mill and mine of the Rosiclare Lead and Fluorspar Co.

A small part of the fluorspar of the district is won from pits and trenches, where veins or lodes outcrop at the surface. The deposits thus mined are known locally as "gravel spar," because they consist of residual, fragmental material liberally intermixed with clay and soil, which must be separated out by washing.

The igneous rocks of the district are of three types: (1) fine-grained, dark-colored trap or, more technically, lampophyre; (2) medium-grained, dark-colored mica-peridotite; (3) volcanic breccia. A close classification is difficult because all three types are more or less altered for some distance below the surface. The lampophye occurs as narrow dikes and sheets enclosed in the sediments; the per-

Exposure of volcanic rock in Hardin County, Illinois.

idotite is found only in the form of dikes; and the volcanic breccia is seen as weathered boulders. The exposures of igneous rocks thus far identified are mainly along the bluffs of the Ohio River, where the prominent and freshly eroded cliffs of sedimentary rocks render the igneous intrusions fairly conspicuous. They are also encountered in coal mining operations north of the river, but surface outcrops are rare, since the material decays readily and becomes obscured by the deep soil of the uplands.

The lampophyre is, in general, composed of prominent sheets of phlogopite, small crystals of pyroxene partly altered to serpentine, and fresh prisms of apatite, in a dense ground mass almost wholly altered to calcite, but still preserving the remnants of a pattern suggesting the former presence of feldspar laths. The mica-peridotite is made up of olivine and pyroxine crystals, either partly or greatly altered to serpentine, together with phlogopite, iron oxides, pyrite, and obscure alteration products. The volcanic breccia is composed of angular to rounded fragments of both igneous and sedimentary materials, together with pieces of feldspar, grains of quartz, and much alteration material.

A Unique Occurrence of Limonite After Wood

—— *By* ——

LOUIS REAMER,
Orange, N. J.

Recently, several interesting specimens of limonite pseudomorph after wood were found by the writer in the woodland section adjacent to an old abandoned limestone quarry located about three miles northeast of the business section of Easton, Penn.

The limonite is characteristic and distinctly shows the original structure of the wood. The most interesting feature of the limonite is that it occurs in lengths of about 18 inches showing saw markings and thus the mineral must be of fairly recent origin. Due to its close proximity to the quarry, the wood originally may have been sawed up for fuel purposes; no data, however, could be obtained as to the history of the quarry or when it was opened up or closed.

One nice specimen found by the writer is 3x8x18 inches in size and has saw markings on the base with its upper crust a well-preserved bark, weight 32 pounds.

The better specimens were found, practically exposed, in a decayed woody soil; smaller and poorer specimens, considerably water soaked with portions decayed or dissolved away, were found a few inches under the ground.

A second trip was made by the writer to the locality in company with Mr. Wm. H. Broadwell, of Newark, N. J., but no large specimens were found although a number of small ones were uncovered.

In conclusion: limonite is a hydrous oxide of ferric iron and found in enormous quantities in the soil. Water, especially swamp water, is heavily charged with iron. Wood exposed to the chemical action of water or soil charged heavily with iron may have its fibers replaced by the iron and in time change entirely into limonite, forming a pseudomorph of limonite after wood.

Editor's Note:—A nice sawed specimen with bark on one side and weighing seven pounds, was presented to ROCKS AND MINERALS by Mr. Reamer.

The Golden Granite near Peekskill

—*By*—

THOMAS W. FLUHR, A.M.

At one time the writer had the opportunity to visit the Mohegan Quarries near Peekskill, New York, operated by the firm of Grenci and Ellis. To the geologist, the Peekskill granite is extremely interesting, for it presents a number of problems as yet unsolved.

Two varieties of stone are taken out at the Mohegan Quarries, the Yorktown Grey, and the Buff Mohegan or Golden Granite. The latter is of particular importance because of its beautiful golden color, especially noticeable in the quartz grains, which has led to its use for decorative purposes in building, one example of its use for that purpose being in the Cathedral of St. John the Divine in New York City. The exact explanation of the golden color has been more or less of a problem.

D. H. Newland of the New York State Museum ascribed the color to limonite produced by weathering of the biotite in the rock. The color seems undoubtedly due to a hydrated oxide of iron, but not due to weathering of the rock itself.

Thin sections of the rock were made. These show that the rock is penetrated by fine hair-like cracks, and that these cracks are filled with hydrated iron oxide. The biotite of the granite is, however, entirely fresh, and not at all altered, so that the hydrated oxide of iron must have come in from elsewhere. When the rock is cut and polished, the yellow of the hydrated oxide of iron shows up through the colorless quartz grains, and these appear to have the yellow color, while the more opaque minerals of the granite, the feldspar and biotite, do not show up the yellow color as well.

On examining the area surrounding the quarries, it is to be noticed that the country rock is not all granite, but is made up largely of schist in all stages of being absorbed and digested by the granite. In other words, the hill on which the quarries are situated represents

MOHEGAN QUARRIES, PEEKSKILL, N. Y.

Roof pendant of schist surrounded by Peekskill granite injected with pegmatite, and in part amphibolized.

MOHEGAN QUARRIES, PEEKSKILL, N. Y.
Old quarry showing inclusion of old country rock surrounded and altered by Peekskill granite.

the upper part of a batholitic mass, one of Daly's "cupolas", where the granite, rich in mineralizers has penetrated upward into the country rock and has now been exposed by erosion.

Two schist inclusions are to be seen in the quarry itself. The schist inclusions are roof pendants of the old country rock, which have been attacked by the emanations from the granite magma, and are penetrated by pegmatites, and have had their more calcareous portions altered to rock rich in amphibole. The granite massive in its upper part has been slightly fractured, probably by relief of strains set up in cooling. Then the hydrated oxides of iron, washed out from the overlying weathered country rock, have been carried down by surface waters and deposited irregularly in the cracks of the granite. The whole process is in fact a matter of secondary enrichment.

MOHEGAN QUARRIES, PEEKSKILL, N. Y.
Golden granite, showing sheet structure and jointing.

The somewhat erratic distribution of the yellow color, and its particular prominence in the vicinity of the schist inclusions lends support to this view.

When the yellow quartz grains are picked out from the granite after crushing, and boiled in acid, the color is entirely removed from them, and the solution gives a test for iron. This, I think, shows that the color is only a surface effect, and not due to something dissolved in the quartz iself.

Another thing to be noted at the Mohegan Quarries is the sheet structure of the granite. Large, well-developed, more or less curved joints separate the granite into layers from two to six feet thick. The cause of sheet structure has been ascribed to the relief of strains set up by cooling of the granite, to relief of strain caused by removal of overlying material, and to an exfoliation effect caused by daily or seasonal temperature changes.

In the Mohegan Quarries, along some of these curved joint planes are found large knots of acid feldspar and colorless quartz. These appear to be acid differentiates of the granite, produced during the last stages of cooling. Their presence in the joints shows that the joints must have been present before the granite was entirely cooled. This supports the view, that in this case at least, sheet structure has been produced by the relief of strains set up during cooling, and not to other causes. The fact that the joints follow in a general way the form of the hill on which they are found is a consequence of that fact that the hill itself is due to the original shape of the granite intrusion which has been more resistant to erosion than the materials into which it was intruded.

The writer desires to acknowledge his indebtedness to Mr. Hazelton of the Mohegan Quarries for samples of the granite and for information in regard to the quarries.

The Geode Field in Indiana

—*By*—
HARRY W. MAUNTEL
Mendota, Ill.

Noticing a very interesting article in the December, 1930 issue of ROCKS AND MINERALS on the geode fields in Illinois, I will endeavor to describe an interesting locality for geodes in central Indiana. The part of the field that several collectors visited, of which I was one of the members, lies east and south of Bloomington, Indiana in Monroe and Brown Counties. This is in and near the limestone region of the State. This limestone region extends from north of Bloomington, south through Bedford. Herein lies much interest and pleasure for the amateur and professional collector of rocks and minerals. Beautiful specimens of fossilized limestone containing shells and crinoids are to be found everywhere and embedded here and there are the geodes.

The main geode field is on the outer edge of the limestone region proper. Here the geodes are generally found in the beds of creeks whose waters washed them down from the neighboring hills. Each spring the freshets loosen more geodes from the hills and deposit them in the creeks or else expose those geodes in the creek beds which heretofore were covered up. This part of the State is very hilly and has the appearance of a miniature Appalachia. Weed Patch Hill is located a few miles east of the geode field and is the highest point of land in Indiana.

The geodes occur in all sizes from one inch up to two feet in diameter. Each geode holds a new surprise to the collector when it is broken open. The hollow geodes are more fluted and rough on the outside and generally contain a beautiful array of bristling crystals of quartz or calcite, or its interior may be banded with chalcedony or jasper of different colors.

Many people in the geode region use these formations to build rock gardens, ornament their porches, oil stations and roads. One can truthfully say that many of the artistic beauties of nature lie in the stones that lay buried and strewn upon mother earth.

Molybdenite and Chalcopyrite near White Plains, N. Y.

—*By*—

MARY WALLECK GARRETSON, A. M.
Supervisor, Nature Lore Workshop, County Center, White Plains, N. Y.

At the Lake Street quarry in the town of Harrison, near White Plains, N. Y., is an intrusion of granite, contemporaneous with the second granite pegmatite intrusion and showing the typical Yonkers gneiss structure. At the north end of the quarry, near the contact with the Fordham gneiss, the rock has been subjected to considerable jointing and through these joint planes have entered mineralizing solutions. The joint cracks are very fine and did not permit true veins of continuous mineral deposit to be formed. However, the mineralizing solutions left their trace in film-like patches of molybdenite and chalcopyrite. These two minerals are not found on the same surface, but are segregated in joint planes from 1½ to 2 inches apart.

The chalcopyrite shows as scarcely more than a film and is probably not extremely rich in copper, judging from its color. The molybdenite is in somewhat thicker patches about one-eighth to one-half inch across and shows the characteristic blue-gray color, the peeling and the malleability of the mineral. I have noted only one vein of molybdenite, but if such mineralization had taken place along more joint planes at the same concentration as on this one, it would pay to develop the ore. As it is, I doubt if such concentration occurs elsewhere than along this single plane. The occurrence is most interesting, however, and, as far as I can determine, unique in Westchester County.

"The specimens are on view at the headquarters of the Westchester County Conservation Association, 8 Martin Avenue, White Plains."

An Occurrence of Geodes in Situ

—*By*—

L. E. ONETO
Stockton, California

Referring to the article on geodes by T. B. Pettigrew in the December 1930 issue of ROCKS AND MINERALS, the writer wishes to say that he has found thin-shelled chalcedony geodes, up to five inches in diameter and lined with amethystine crystals one-half inch long, in *situ* in lava, in the high Sierra region in Tuolumne County, California.

The geodes occur in a deposit commonly known as a "chimney", and at an altitude of about 8,500 feet. The chimney is about 100 yards in diameter; the geodes increasing in size toward the center and with depth.

Despite the thinness of the shells, the geodes are extremely hard and only one out of thirty was broken in cutting them out with a three pound drill hammer and gads.

Besides geodes, opals, agates and petrified wood are also to be found in the lava.

The Irish Turf Industry

—*By*—

P. ORMSBY LENNON

Royal Empire Society, London, England

Illustrations by the Author and are of the Tullaghstown bog, about 4 miles from Navan, County Meath, Ireland.

One-seventh of Ireland's total area is bog land. There are sections of the island through which you can walk for miles and miles; flat, monotonous, greeny-brown wastes of bog extending on all sides, sometimes as far as the eye can reach. At one time of the year these marshy plains are colored magenta and purple with wax-belled heather blooms; at another, they are white-flecked with the nodding canavaun—the tufted bog cotton.

These bogs grow at the rate of three or four inches a year. And as season follows season, the marsh plants in endless cycle keep springing up, their wiry roots deriving nourishment from the dead tissues of their predecessors. Some Irish bogs have a peat depth of forty feet and more, but as the lower strata of turf have been subjected to tremendous pressure from above, age cannot be measured from height alone.

Some bogs had their origin at the close of the Ice Age, at the time when glaciers melted where they stood, leaving great puddles of water standing in their place. Owing to the impervious nature of marls and gravels below, this water did not escape, but formed muddy pools in which lush aquatic plants throve. From the shallow pool borders these plants spread to the deeper centers, mud and organic remains accumulating around their stalks. A spongy mass was thus formed, well fitted for growth of moss which began to appear. The moss absorbed much water and shot out new plants above, while the underneath part was rotting and compressing into a semi-solid sub-

Removing the top crust of the next slice to be worked on a section.

stance. In such manner did these prehistoric marshes get filled and turf bogs have their genesis. Sometimes, too, from the nucleus of a spongy basin, the peat insinuated itself outwards on all sides, covering wide, low-lying areas with its spongy water-saturated burden.

From time immemorial, peat has been Ireland's national fuel. Your bog-trotter, however, does not call it peat; he calls it turf. The sods are usually cut in June and July when the weather is good, and some of the winter-accumulated moisture has drained and evaporated off the bogs. In winter these areas are both unworkable and impassable for even the lightest of traffic.

The cut-away face of a bog looks something like a chocolate-shaded Neapolitan cake iced with a frizzy covering of heather, sphagnum moss, and a variety of other plants and lichens. For a few feet down, the turf is a lightly-compressed, springy mass of dead wiry vegetation, just moist in summer and not very easy to cut. This top crust is useless as fuel, for it burns too quickly.

Chopping out wet sods from face with *slane*.

Below comes the light-brown layer known as **shpadah** or white turf. It, too, is valueless as fuel. Under this again, comes the brown turf, a quick burner but marketable. But the turf **par excellence**, the black turf, comes on the bottom layer of all. It is dark like coal, tremendously compressed, and almost the consistency of new cheese. When freshly cut it can be kneaded in the hands like plasticine.

Turf has been removed by mechanical dredges and excavators, but the unstable nature of a bog has always militated against the successful working of such heavy plant. The method of hand cutting, therefore, perhaps the most ancient type of fuel mining in the world—holds general sway in Ireland today.

I have spent hours watching turf cutters at work. Each man pays a small annual rental for his section, usually a perch in width. (An Irish perch measures seven yards in width.) Back from the face they can cut as far as they like, but few advance farther than a perch in a year.

The method employed for winning turf is primitive, but efficient. Part of the surface-crust topping the face is undermined with spades, the fragment afterwards being cut away with a broad-bladed bog knife and tumbled back into the deep hole from which the last section of turf has been removed. Then with the **slane**, a narrow sort of spade, the underlying turf is taken out, white first, then brown, and finally black. Some days, of course, elapse before the slice is cut down to the bottom.

For hours on end, the cutter works, chopping off oblong sods of wet turf with mathematical precision, swinging them up on the flat of his **slane** to the "lorry" driver. The latter person catches them, one by one, deftly packing them on his donkey-drawn vehicle. When a couple of dozen or so sods have accumulated, the donkey is driven to the terrace stretching back from the cut-away face. There, the sods are spread out on the ground to dry. The donkey is then driven back to the face, and another "lorry", which has been loaded by the cutter's other assistant, yoked to the collar chains. Thus is peat drawn away to dry.

The "lorry" is truly a prehistoric vehicle; it has no wheels but runs on log

Drawing fresh-cut sods from bog-face on *lorry*.

rollers. Wheels would only sink in the soft peat. Larger vehicles of this type were in general use throughout Ireland before the advent of carts.

As the cutter gets down towards bottom level, water can be seen oozing in great drops through the lower part of the cut-away face. Were the work-pit not constantly baled, it would soon fill up. Into this pit is eventually dumped the useless top crust and white turf from the next section to be worked. The result is a devil's brew of the consistency of watery porridge, sometimes yards in depth. Woe betide the luckless wight who falls in such a bog-hole. There is no escape.

After the wet turf sods have been spread on the worked terraces for a week

Castling turf to dry it further

Section of a bog face in background. Turf being dried in *castles* in foreground.

or so, they form a slight crust. This enables them to be built into little **clor**auns or "castles" of about a dozen sods, so arranged as to give the air free ingress. When sufficiently dry, these little heaps are built up into stacks known as "clamps". A "clamp" of turf is a good horse cart load and sells anywhere from 10/- to 25/- (shillings) according to quality (a shilling is worth approximately 25c). On some bogs turf is carted away on donkeys' backs, packed in panniers; on others, in carts.

Turf—even the cherished black—has not the fuel capacity of coal. The average air-dried sod contains up to 25% of moisture, and the fresh-cut stuff 6% of water to 1% of compressed fibre.

Work on bogs is undertaken by whole families; the sturdy **gosoons** and **colleens**

Building a "clamp."

Children at work on a bog.

toiling just as hard as the pater-familias and his better half.

As the bog-face is cut back, the bog hole water is drained off through long dykes, and the terrace land, in course of time, becomes reclaimed. It is never of much use, though moderate crops of potatoes, etc., can be raised thereon.

Bogs have one extraordinary property. They will preserve the body of an animal or a human being for almost incredible lengths of time. Some peaty acid in the turf turns fatty tissues into a sort of wax. Medical men call this changed condition adipocere. Not very long ago, turf cutters unearthed the body of a

Wet turf spread out to dry on bog terrace.
A colleen with boots but bare legs—also bobbed hair.

Carting dry turf off the bog.

beautiful woman from a Westmeath bog. She was perfectly preserved, and had long golden hair that fell below her waist. At the inquest that was held, it was concluded her body had been in the bog for at least a century and a half.

Some years ago, on another bog, a man dressed in a cowskin jerkin was found. An eye-witness described him as "looking like Gurth the swineherd". Yet at another time the body of a man in Elizabethan dress was dug up by cutters. It was as fresh as though it had been popped in quite a short time previously.

A French scientist has recently perfected a process by which power alcohol can be economically extracted from peat. At a demonstration he showed that one ton of air-dried Irish turf can yield 28 gallons of ethyl alcohol, besides such products as acetic acid, formic acid, acetone, and furfurol. The latter substance is used for making resin synthetic, and can also be used as a combustible in internal combustion engines of the Diesel type. Such peaty residues as are left over can be converted into briquettes for fuel purposes, and it is claimed they are as good as coal.

The Irish Senate have had a committee considering the process, and it may be that in time such will be put to practical commercial use. But as bogs will not bear the weight of heavy traffic or of cumbersome plants, there are likely to be many difficulties in the way.

Mr. William F. Woodward, a member of the School Board of Portland, Oregon, has become interested in the introduction of the study of minerals in the high schools of his city. We hope Mr. Woodward may be most successful in his endeavor to establish the study of minerals in Portland.

A traveling mineral set, Ward's DF2 collection, has been loaned the Boy and Girl Scouts of Cayuga county, New York. This set contains 64 fine specimens and will be of great help to those troops whose members are studying mineralogy. The set will probably remain about a month with each troop.

Neptune and an Architect

—*By*—

MARIAN MacLEAN FINNEY

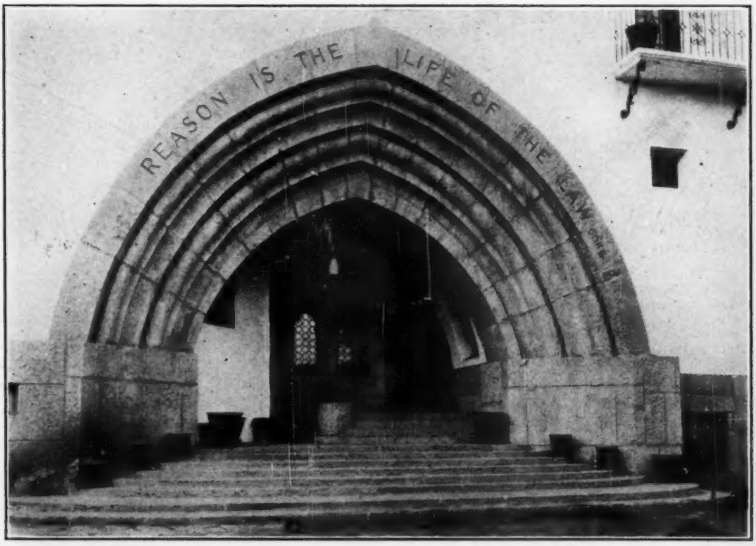
This is a true story of how Old Ocean helped a modern architect. Once upon a time, so many centuries ago that most of us cannot count back that far, the region about the present city of Santa Barbara, California—one hundred miles north of Los Angeles—was an ocean bed or inland lake. Its surface was the burial place of myriads of sea animals and plants. Then a volcanic eruption changed the altitude. The sea drained off from the hills, leaving great quantities of sand on which the sea shells, fish bones and sea weed were left exposed to the elements.

Wind huddled the sand together, until in time the combined animal and plant debris was covered by uneven mounds. Rain percolated through the mass, and by the effect of one mineral acting upon another, made a natural cement which welded the particles together. Later, the first mound was covered by another and still another, the pressure finally squeezing out all the water. Heat and frost by turns expanded and contracted the now-dry formation, it settled into some depression of the land which its weight made for itself, and at last it was a vein of sandstone, one of the decorative building materials used by the present day architect.

The deposits found in this particular section have been called "Santa Barbara sandstone", and used thereabouts for more than a century and a half. A newly discovered vein, however, possesses some remarkable features. It is a variegated, warm colored stone, shading from gray through the buff-yellows. A short railroad had to be built to transport the stones from one level to another in Refugio Canyon, where the "find" was made, the ravine being at an angle of forty-five degrees, the deposit at a height of one hundred, fifty feet, and the stones

One of the entrances to Santa Barbara County Court House, Santa Barbara, California. Constructed of "Santa Barbara Sandstone."

"Anacapa Arch" and Fountain constructed of "Santa Barbara Sandstone"—Santa Barbara County Court House, Santa Barbara, California. (Lettering, pillars, figures, —all carved from this pliable and beautiful stone.)



"Court Loggia," one of the several entrances to the Santa Barbara County Court House, Santa Barbara, California, showing the use of "Santa Barbara Sandstone" as a trim. Its buff-yellow contrasts pleasantly with the white of the building.

Fountain at Santa Barbara's new million-and-a-half dollar court house. Constructed entirely of "Santa Barbara Sandstone"—pliable, durable, beautiful.

(many of them) twelve feet across and weighing fifteen tons. The most surprising feature is a stratum of fossil remains nearly a foot thick, although the quarry is three and a half miles from the ocean, and two hundred feet above the present sea level.

This sandstone is particularly desirable in certain types of building, imparting an aged appearance. It has therefore been used very successfully in the new Court House built in the city of Santa Barbara for the county of that name, where it simulates ancient Spanish stone work. It is equally appropriate in the "Wee Kirk o' the Heather", replica of the old Scotch church where Annie Laurie worshipped, which has just been completed near Los Angeles.

To the architect this sandstone, showing the fossil remains through the tooth-chisel finish, is another building material. To the naturalist, however, is has turned the pages of history and photographed for us an age long before the printing press.

Wind-Faceted Pebbles given to Museum

The Division of Geology and Mineral Industries of the Museum of Science and Industry, Chicago, Illinois, has recently received a gift of six wind-faceted pebbles from Dr. Kirk Bryan, Assistant Professor of Physiography, Harvard University, Cambridge, Mass., as follows:

A—Wind-faceted pebble, modern weathering and lichen on under side showing wind action is ancient. From Highland Light, Cape Cod, Mass.

B—Faceted pebble (First kauter) retains shape, but has lost wind-scoured surface by weathering. From near Oak Bluffs, Martha's Vineyard, Mass.

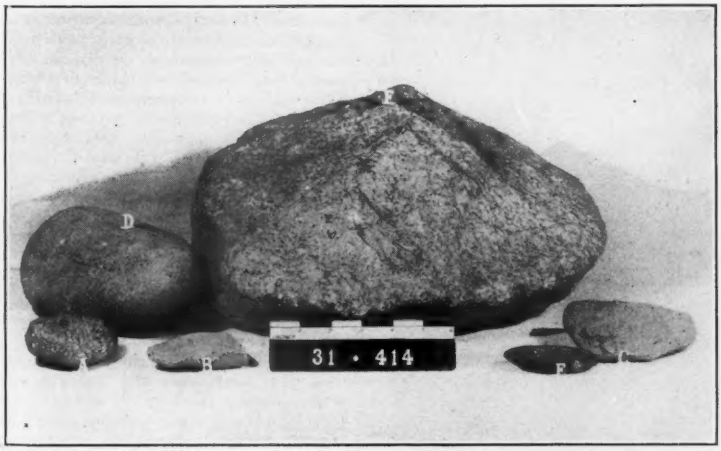
C—Faceted pebble (Felsite.) Shows much weathering and retains adhering sand which shows that it comes from below present surface. From East Chap, Martha's Vineyard, Mass.

D—Faceted pebble (First kauter)—porphyry. Shows weathering since wind scoured. Collected at Lagoon between Oak Bluffs and Vineyard Haven, Martha's Vineyard, Mass.

E—Water-worn pebble, faceted by wind action. Wind scoured surface nearly destroyed by weathering. From Tinso, Cape Cod, Mass.

F—Wind-cut boulder from East Chap, Martha's Vineyard, Mass.

All of these pebbles were gathered in 1930.



Six wind-faceted pebbles presented to the Museum of Science and Industry, Chicago, Ill. by Dr. Kirk Bryan, Harvard University, Cambridge, Mass.

Hunting Beach Agates

—*By*—

J. M. TRACY

Portland, Oregon

In Lincoln County, Oregon, along the rugged shores of the Pacific Ocean, those mineral collectors who make semi-precious gems their specialty, will find here a field, both pleasing to the eye and to their collecting taste. For it is here that the famous Newport chalcedony, agates, jaspers and other gem minerals are found. Agate, Nyes, and Yaquina beaches are the best places to seek these minerals but any of the numerous smaller beaches may contain them also.

The lure of hunting agates and other gem minerals is very thrilling, in fact so much so that I have seen elderly and very dignified ladies, who have felt the lure for the first time, crawling along on their hands and knees in the sands and gravels, not heeding at all that the ocean water was ruining their fine dresses and expensive slippers.

Agate Beach, Oregon, after a storm.

But if you wish to present the appearance of a professional hunter the following equipment is necessary: rubber boots or high top shoes, water proof khaki or rubber trousers, sleeves rolled up high or else a sleeveless shirt, a sack or bag with long straps that can be slung over the shoulders and a smaller sack hanging at about arms length at the side (the sacks should have draw-mouths so minerals may not fall out.) You are now ready for the hunt.

If the tide is coming in, wade out to the serf line and as the breakers roll up and drain back over the sand and gravel you may see the gemmy minerals uncover and—a quick grab and you may have a treasure.

If the tide has gone out, you will find the shores covered with pebbles and boulders. Now, to your equipment add a walking stick with a point on the end with which to turn over or dig out of the sand those specimens which are buried. This stick is a necessity as it avoids the needless stooping down to turn over or dig out some valueless specimen; were one to stoop down for every specimen seen he may find it a back-breaking task and soon exhaust himself. As the smaller bag is filled its contents are transferred to the larger bag carried over the shoulder.

Newport chalcedonys are so well known that little mention is needed of them, but just as beautiful and interesting are the jaspers and agates which are found here. Among the various agates that have been collected are: clouded, moss, banded, ribbon, flower and the rare blue-black and water agates. Rock crystal, citrine, carnelian, heliotrope, plasma, basanite, onyx, as well as silicified wood are also found.

The Gem Mines and the Wegener Continental Shift Theory

—*By*—

GEORGE O. WILD

10 *W. 47th Street, New York, N. Y., and Idar, Germany*

Alfred Wegener is the originator of a theory, well sustained by geological facts, that the present continents were clustered into a huge continental block which split up into several parts, each part floating upon a rigid underground constituting the bottom of the Pacific Ocean. The forces which move these continental sectors are termed "Polflucht" forces (fleeing the poles) and they tend to shove them towards the equator. Wegener's observations in Greenland show that this part of the North American Continent moved west at an average speed of 20 meters per year during the last hundred years. The movement continues and an almost exact mathematical formula has been derived for expressing the value of these forces out of the mass of the continent, the average height of elevations, and the angular speed of the spot. On the poles this force is zero but near the equator it attains a maximum value.

It is interesting to note that the regions of the earth's surface bearing precious stones were at the time of the Carboniferous period clustered around a spot now near the Brazilian east coast. Rifts running from pole to pole split the large continental block and ripped Europe and Asia away from America.

If one draws a line near 20° latitude across the present map one hits all the principal precious stone mining districts and these yield in many cases identical kinds of stones and have identical geological formation as i. e. the coast of Brazil and the mountains near the South African coast. The line touches the Minas Geraes district of Brazil, the South African district where diamonds, beryls, tourmalines, etc., are found and Madagascar which yields exactly the same stones as Minas Geraes. In former times the line would have hit Ceylon and very probably Burmah as well as Queensland near a spot where sapphires are being mined now.

The writer believes that this connection has not been observed previously and it is here being mentioned for the first time.

Dr. Herbert P. Whitlock in "The Art of the Lapidary" says: "The native lapidaries of India and Ceylon have reduced the apparatus of gem cutting to its lowest terms. Such a native artisan seated on his carpet in the bazaar, turns the stone lap in front of him by the primitive means of a bow, the string of which is wrapped around the axis of his stone grinding wheel. By his side is a bowl containing the emery he uses as a grinding medium, mixed to the right consistency with water, and his left hand is the only holder for the gem stone that he is manipulating. This is indeed reducing the tools of gem cutting to an absolute minimum and emphasizing in a striking way the essentials of this art."

Notes on the Mineralogy of the Silver Lead-Zinc Deposits of New South Wales, with Special Reference to the Barrier Ranges Silver Field:—By George Smith, (Late Inspector of Mines, N. S. W.) Reprinted from the "Journal and Proceedings of the Royal Society of New South Wales, Vol. LXIV". Pages 224-263. The purpose of these notes is to present some of the writer's observations on the mineralogy of the Barrier Ranges silver field made before and after the period 1891-3, referring particularly to the silver-lead-zinc ores of the Broken Hill district, and at the same time drawing attention to certain inaccuracies in previous publications.

The Metropolitan Mineral Area of New York City*

—*By*—

JAMES G. MANCHESTER

"One of the most interesting mineral-districts in the world is contained in the territory lying within a radius of fifty miles (80 kms.) of New York City. This area, commonly known as the Metropolitan District, comprises portions of three states, occupying a very small part of the southwesterly section of the State of Connecticut, the southeasterly portion of New York State, and the northerly part of the State of New Jersey. This area, with the exception of a few scattered sections in the outermost portions, is the territory at present receiving serious attention on the part of the Regional Planning Committee formed to study the future growth of New York City and to recommend certain civic improvements to meet the same.

* * *

"This region having been subjected to vast rock movements through the uplifting and submerging that took place when this part of the continent was in the making, many veins, dikes, vugs and pockets were formed and it is here that Mother Nature throughout these millions of years has wielded her magic wand to produce these beautiful mineral crystals which are so much admired. The pre-Cambrian gneisses of the hills covering a large part of this area, the Triassic red sandstones and shales in the Newark series, the diabasic and basaltic trap ridges of the Palisades and the Watchung Mountains, the serpentines and limestones which appear in a number of well defined deposits, are all rich in mineral content.

"In addition to this vast movement resulting from earth making the rocks have suffered subsequent disruption by man. Probably no like area on the face of the globe has been subjected to such intensive artificial removal of rock through engineering enterprises. The first settlers, almost as soon as they had erected shelters, were obliged to look about for materials to use in the arts and industries, for it is from the earth's crust that those material things which are necessary for life and happiness are drawn. Much prospecting has been done in the search for ores and many mines have been operated. To provide water for its millions of inhabitants, reservoirs and aqueducts have been established. For the erection of gigantic buildings extensive excavations have been made in the rock floor. To facilitate transportation miles of streets, tunnels and railroad cuts have been constructed, in many instances through solid rock.

"One usually associates mining activities with the open country and the wilds of distant mining camps. The fact that such operations have been conducted almost within the confines of a great city is not generally known to many of the inhabitants thereof.

"In looking over the past history of the district we find that in this area over 300 iron mines and more than twenty copper mines have been operated at one time or another, but the discovery and opening up of new fields in the West and in foreign countries created a competition which could not be met, so that at present no copper mines have been in operation for twenty years or more, and only a few iron mines are producing at this time. Many of these iron mines, however, have never been worked out and if their ore (magnetite) ever becomes scarce in other regions the many abandoned mines in the district may once more take their place in the industry and be made to supply large quantities of ore for an indefinite period. The limonite ore mined on Staten Island and in East Brunswick, New Jersey, was used for blast furnaces and partly to produce red ochre paint.

"The white limestone occurring in this area has been worked extensively for flux

*Excerpts from "The Minerals of New York City and Its Environs", by James G. Manchester, bulletin of the New York Mineralogical Club.

W. G. LEVISON, PHOTO. PLATE No. 1 (1908)

ACTINOLITE DIKE

130th St., near Convent Avenue, Manhattan Island, New York City

W. H. BROADWELL, PHOTO. PLATE No. 2 (1929)

COPPER MINE (MILL AND DUMP)

North Arlington, N. J.

AGNES V. LUTHER, PHOTO. PLATE No. 3 (1917)
TUNGSTEN MINE (ENTRANCE)
Trumbull, Conn.

PLATE No. 4 (1928)
TILLY FOSTER IRON MINE
Near Brewster, N. Y. (Pit Filled with Water 620 Feet Deep—Ice Coated)

F. W. APGAR, PHOTO. PLATE No. 5 (1911)

BUCKWHEAT ZINC MINE (OPEN PIT)

Franklin Furnace, N. J. (Showing Franklinite Vein)

PLATE No. 6 (1922)

KINKEL FELDSPAR QUARRY (WASTE PILE)

Bedford, N. Y.

AGNES V. LUTHER, PHOTO. PLATE No. 7 (1915)

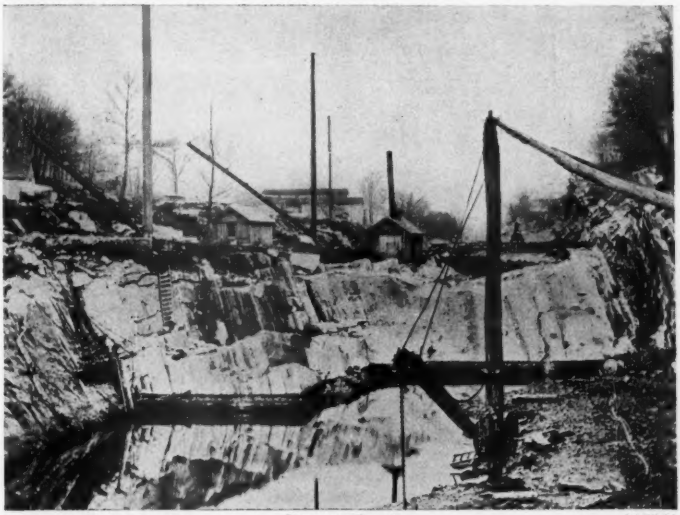
GRANITE QUARRY

Valhalla, N. Y.

AGNES V. LUTHER, PHOTO. PLATE No. 8 (1910)

LIMESTONE QUARRY

Sing Sing (Ossining,) N. Y.



W. G. LEVISON, PHOTO. PLATE No. 9 (1888)
MARBLE QUARRY
Tuckahoe, N. Y.

AGNES V. LUTHER, PHOTO. PLATE No. 10 (1900)
TRAP ROCK QUARRY
(Showing Contact of Basalt of First Watchung Flow on Newark Sandstone)
Upper Montclair, N. J.

W. H. BROADWELL, PHOTO. PLATE No. 11 (1915)

McKERNAN AND BERGIN TRAP ROCK QUARRY

McBride Avenue, West Paterson, N. J.

W. H. BROADWELL, PHOTO. PLATE No. 12 (1921)

FRANCISCO TRAP ROCK QUARRY

Great Notch, N. J.

PLATE No. 13 (1909)

THE BERGEN ARCHWAYS (ERIE R. R. "OPEN CUT")
Jersey City, N. J. Cut No. 4 During Construction

J. J. SCHOONHOVEN, PHOTO PLATE No. 14 (1921)
NEW YORK MINERALOGICAL CLUB
SERPENTINE DEPOSIT
Dongan Hills, Staten Island, N. Y.

W. H. BROADWELL, PHOTO. PLATE No. 15 (1924)
NEW YORK MINERALOGICAL CLUB
FELDSPAR QUARRY
Branchville, Conn.

for use in the many iron works, for burning into lime and also for agricultural purposes. The remains of abandoned lime kilns may be seen at various places throughout the district. Today much of the limestone is reduced to a fine powder for use as a light abrasive and for the making of artificial stone. Extensive operations of this kind are now under way in Westchester County.

"Several mines rich in zinc and manganese in the Franklin Furnace district of New Jersey have been in operation for seventy years and are big producers at the present time. The Franklin ores are chiefly valuable as a source of zinc, but also on account of the manganese and iron they contain. From them is made a high grade spelter (commercial zinc); zinc oxide, used as white paint and in the arts; and spiegeleisen (an alloy of iron and manganese) used in the production of steel. It is reported that about 1830 Dr. Fowler, then owner of the mine, produced a "bluish-white powder" from the ore that he used as a substitute for white lead with which he painted his house, which was perhaps the first time oxide of zinc from the ores of an American mine was used for house painting. It was about 1838 that the first metallic zinc made in the United States was reduced from zincite ore furnished by these mines. This metal was used in preparing brass for the first set of standard weights and measures ordered by the Congress.

"Emery, a variety of corundum, used as an abrasive, is being taken out of the rocks in the Peekskill region and at certain periods in the past has furnished a goodly portion of that ore consumed in this country; here, too, foreign competition has slowed up this industry.

"Feldspar, quartz and mica mines are being operated quite extensively at the present time in a number of localities a few miles north of New York City in Westchester County. One of these mines at Bedford has been in continuous operation for fifty years and over one million tons of ore has been taken out. The ore is crushed to a fine powder and is afterwards shipped to various industrial plants. The quartz is used as a wood filler, for silica paint and as a constituent for scouring soaps. The feldspar is used in the manufacture of china and porcelain ware, putting the fine glaze on that material. The production of mica, despite the fact that it is an important mineral in the rocks of this vicinity, has never attained the basis of a settled industry, the material being of such a quality as would not permit its use for sheet-mica purposes. It was formerly allowed to accumulate on the dump; recently a market has been found, with the result that this side of the mining operations is receiving considerable attention at the present time.

"Beryl, which is occasionally met with in large crystals weighing several hundred pounds each, has been collected as a by-product and for years shipped to Germany where a ready market was to be had. The chief use of beryl in industry has been and still is as a constituent of enamels for enameled steel ware. Beryl contains the rare metal beryllium (also known as glucinium), discovered in 1828 by Wohler, but it is only quite recent that methods have been discovered to isolate it on a semi-commercial scale. This has stimulated the interest in possible sources of beryl which could be relied upon as adequate for commercial production of this metal. Beryllium is a hard and brittle metal and for this reason few uses for it have been found. Heretofore, it has had but a single commercial use, being employed for the windows of certain X-ray tubes. Most of the research on beryllium has been conducted in Germany with a view to its use as an alloying metal with iron, copper and nickel. The recent discovery that beryllium has all the qualities of aluminum and at the same time is a lighter metal has created a demand for beryl and this mineral is now given a prominent place in the products of the Bedford quarries.

"The rose-colored quartz at Bedford is not only best known to collectors but to the neighbors of the quarries, for in driving about the vicinity this mineral will be found on display in the front yards and along the walks. Shipments of this material have been made to Europe and the Orient to be carved into ornaments, no doubt much of the finished product finding its way back to the United States.

"Several years ago the newspapers carried the announcement of the discovery by the Danish chemist, Georg v. Hevesy, of the new metal hafnium, and later when a small amount of one of its salts, "two little pinches of white powder, sealed in tiny glass flasks," was received in this country, considerable inter-

est was aroused. Few people, other than members of the chemical profession and local mineralogists know that we have within the borders of the Metropolitan District one of the richest available ores carrying this new element, for it has been determined that the Bedford cyrtolite consistently contains 5.5 per cent of hafnia, HfO_2. This mineral as yet has not been found in commercial quantities at Bedford, but the accumulation from past operations would be sufficient to produce fifty pounds of this new element. The uses to which it can be put are yet to be applied, although they parallel closely those of its sister element, zirconium.

"Graphite, used as a lubricant and for the manufacture of "lead" pencils, was successfully mined years ago at Bloomingdale, New Jersey, the output at that time finding a ready market.

"Pyrrhotite occurs at Anthony's Nose, on the east shore of the Hudson River, just north of Peekskill. This deposit was worked for a number of years, the product being used locally for the manufacture of sulphuric acid.

"Arsenopyrite has been mined periodically in the northern part of Westchester County for the arsenic it contained. A prospect pit in which considerable work has been done is located on the Brown farm, between Edenville and Mount Adam in Orange County.

"Several lead mines have been operated, one at Sparta, New York, about one mile (1.6 kms.) south of Ossining, where galena and other lead minerals occur in the limestones. It is also reported that a copper and silver mine was at one time worked here; native silver was discovered in 1825 and a company was formed to operate the mine in 1827 and some work was done but the enterprise was soon abandoned.

"Tungsten ores were mined many years ago at Trumbull, the industry being revived during the world war. The serpentine deposits on Staten Island have been mined for asbestos to a limited extent. Garnet and topaz, used for abrasive purposes, were mined in a number of localities in the Fairfield County, Connecticut, section of the district.

"Mineral deposits useful as a fertilizer are present in large quantities in the green marl belt extending from Sandy Hook to the southwest, the larger part of this belt lying within the district. These deposits are known to contain potash, lime and phosphate, and the marl has been marketed on a small scale as a fertilizer for many years. The potash is contained in the mineral glauconite, a hydrous silicate of iron and potassium, which makes up the green sand of the marl. Although it has been estimated by competent investigators that this belt contains 256,000,000 short tons of potash (K_2O), enough to supply the needs of the United States for one thousand years, the commercial exploitation of the deposit is not economically possible in view of established domestic (Searle's Lake) and foreign sources of supply.

"Great, indeed, are the resources of the Metropolitan District in numerous quarries of the most durable as well as beautiful building stone. Many varieties of stone used in the construction and decoration of buildings within the district have been quarried and are being quarried at the present time. These include the granites of various colors,—just now brown granite is being cut at Mohegan, in Westchester County, for use in the construction of the new cathedral on Morningside Heights. The red and brown sandstone of the Newark series of rocks is represented by miles of dwelling houses and public buildings on Manhattan Island erected many years ago;—the present Trinity Church on lower Broadway is of this material; this stone, however, lost its popularity, because the builders laid the stone on edge, with bedding planes vertical, which has occasioned its rapid scaling and flaking. The various gneisses have been used to a considerable extent; one of the best examples of the use of this stone is in the College of the City of New York, whose campus buildings present an imposing spectacle in the northerly section of the city. In the past many quarries in the district provided fine white marble for numerous buildings. For decorative purposes, the serpentines of Staten Island and Montville and the limestones in the Westchester section, when polished, have furnished beautiful examples for interior decoration; the most recent use of the limestone is represented in the marble finish of the new Colonial room at the Metropolitan Museum of Art, the material being quarried at Tuckahoe.

"Deltas of many streams within the district have formed clay beds, the source of supply for the manufacture of bricks

and ceramic ware, the total of finished products being valued at many millions of dollars each year. The alluvial deposits of many stream valleys yield sand for building purposes.

"The requirements of the Metropolitan District for vast amounts of crushed stone for the construction of roads and as a constituent of concrete and cement work has led to a large amount of quarrying to produce the material required. Many quarries have been in operation from time to time, the sources of material being the gneiss and schist of Manhattan Island, the granites and gneisses to the north in Westchester County reaching over into Fairfield County in Connecticut and many points in Northern New Jersey, the diabase sheet of the Palisades, Snake Hill, etc., and the basalt of the Watchung Mountains, principally at Paterson, Great Notch, Upper Montclair, Milburn, Springfield, Summit, Chimney Rock and North Plainfield.

"The removal of all this rock has opened up a great field for research, not only for the trained scientist but for the amateur mineral collector as well. Within the area there are a half dozen universities and colleges filled with thousands of students, many of whom devote long periods to work in the natural sciences. Both the state and national governments send their trained scientists into the district to study its geological formation and mineral content. In addition there are two societies whose activities are devoted to the study and collecting of minerals, the New York Mineralogical Club * * * organized in 1886, and the Newark Mineralogical Society, organized in 1915. There is also the New York Academy of Sciences whose proceedings are filled with the mineralogical and geological history of the district.

"That advantage has been taken of these opportunities for research work as they presented themselves is evidenced by the vast amount of literature dealing with the subject. Over 1000 books, pamphlets and papers have been published. Four hundred mineral localities are known. Most interesting of all, however, is the fact that 454 varieties of minerals, representing 263 distinct species, have been reported; some twenty-five of these are found nowhere else, and the list is being added to each year. Many of these minerals are objects of much beauty and have supplied museums and private collections throughout the world with unequalled specimens. It is safe to say that this mineralogical record exceeds that of any other known area of similar dimensions with the possible exception of the famous mineralized zone at Langban, Sweden."

E. P. Bottley of Lyell House, Shelton Lock, Derby, England, (late of 27 Portland St., Derby) has acquired the good will and immense stock of rocks, minerals, and fossils of James R. Gregory & Co., of 30 Church St., Chelsea, England, (late of 139 Fulham Rd., South Kensington, London).

The name and address of the new firm is:—

Gregory, Bottley & Co.,
Mineralogists and Geologists,
30 Church Street,
Chelsea, London, S. W. 3, England.

Our good wishes are extended to Mr. Bottley and to his new company and we hope and trust that Gregory, Bottley & Co., will live, flourish and prosper for many, many years.

A large brown jasper (boulder), weighing 7½ pounds, was found at Toddville, near Peekskill, N. Y., last May, during the construction of the Westchester County Parkway, and presented to the Editor by Robert Krug, a young civil engineer employed by the Westchester County Park Commission. We are grateful to Mr. Krug in donating this interesting specimen to us.

Messrs. Willis Croft, George Dietz and George Hayes, also young civil engineers employed by the Park Commission, Peekskill Residency, have kindly made frequent contributions of interesting specimens found along the parkways.

This remembrance of our special interest in the minerals of this locality is greatly appreciated.

A Brief History of Volcanology

—*By*—

EUGENE W. BLANK

State College, Pennsylvania

"I know not where that Promethean heat." —Othello, Act V, Scene II.
"If the dark empire of Pluto had half opened before me,
I should not have been seized, I admit, with greater horror."
—Fenelon.

Nature in her varied moods presents to mere man riddles strange and inexplicable. On every hand we find the stupendous forces of nature at play, silently, unobtrusively disintegrating and eroding at one place, concentrating and building up another. There is no escape from the potentiality of nature. She presents silent yet eloquent sermons in the lightning's flash, in the slow advance of the icebound glacier, in the tumultuous beating of the restless sea.

Man in his vaulting egotism has wrested from the starry depths of heaven their secret, from wind and wave their power, he has tamed the lightning flash and beside these triumphs a list without end of equally important conquests. In a word man has taken over the universe and made it his own. Yet in seeking new worlds to conquer insatiable mankind has lost sight of the fact that the humble earth, on which perchance it stamps impatiently, is a vast and unknown country. Like the unseen half of the moon, that mysterious lunar landscape, so near, yet so tethered in celestial space as never to reveal its charms and secrets to mortal eye, this terrestrial ball contains strange riddles. Its very proximity has caused it to be overlooked. The surface of our globe has been merely scratched and not deeply scratched at that. If the world were to be suddenly reduced to the size of an apple our deepest mines would not traverse the thickness of the skin. The vastness of the hidden interior of our globe staggers the imagination; it is inconceivable.

What is the composition of the earth, is it variable or uniform; what constitutes its main store of energy, is this energy diminishing or being augmented, will the world ultimately become a frigid lifeless cinder traveling through the unfathomable vastness of space? What are earthquakes and what are volcanoes? Meditation brings to pass such speculations as these when we come to speak of this little known region. I have space to discuss but one phase of the latter subject.

In speaking of volcanoes one might be led to say they are of ephemeral importance and to be lightly treated of in word and thought except perhaps, by those forced through circumstance to dwell within the shadow of a smoking cone. Yet on looking back through the pages of history we find them to be repeatedly lit with volcanic flares. Since the year 1500, from which time on we have more or less accurate records of volcanic activity, 98 eruptions of 57 volcanoes have destroyed 190,000 people and done untold property damage. We are forced to admit that a close study of volcanology, if only to prevent more deaths, is of prime importance.

To the untutored mind of early man all the forces of nature were vested in gods. Hephaestos was the god of fire and the smoking volcanoes were supposed to be his abode. Hephaestos was driven from heaven by Zeus and found refuge on the island of Lemnos. On this volcanic island and especially in Mount Etna, that smoky sentinel of the sunkissed Mediterranean, from whose depths come subterranean thunderings and in whose cone there plays nightly a lambent flame, popular imagination has placed the workshop of Hephaestos and his trusty followers.

The early savages inhabiting volcanic regions had more or less strange superstitions in regard to volcanoes and they frequently offered human sacrifices to ap-

pease the gods of the fiery mountains. The crater of Massaya was in eruption at the time the Spaniards penetrated Central America and they have left records telling of the cruelties practiced by the natives. Oviedo who, in 1520, explored El Inferno del Massaya, as it was then called, tells of numerous sacrifices that were offered to the subterrean gods. From time to time the terrified natives tossed into the yawning pit young girls to propitiate the omniscient gods. (1)

On making a search of the literature bearing either directly or indirectly on the subject of volcanology one is struck with the number of theories offered to account for their activity.

One of the most celebrated and probably one of the earliest hypotheses was given to the world in 1700 by a chemist named Lemery. He remarked that a mixture of iron-filings and sulphur suitably moistened with water would ignite spontaneously, erupting lava and having force enough to shatter mountains. At the present time no importance is attached to this hypothesis. (2)

The celebrated Werner, whom we today regard as one of the founders of modern geology, gave his opinion on volcanoes, which attracted numerous adherents, toward the middle of the 18th century. He believed volcanoes to result from the combination of beds of coal and pyrite under the influence of water. While this accounted for many of the products of volcanoes it is, as we know today, untrue.

His theory was revived from time to time by well-meaning scientists during the early years of the 19th century. Thus in 1822 a work appeared in Berlin in which the author claims volcanoes to derive their activity from the contact of sulphur, asphaltum, coal and metallic minerals together with water. (3) In Naples in 1823 a book was published in which volcanic activity is explained on much the same basis. (4)

Patrin was struck by the fact that volcanoes are ordinarily neighboring the sea and he came to the conclusion that the principal factor in an eruption is hydrochloric acid. (5) His wild and fantastic hypothesis makes interesting reading but is too detailed to be given here. His supposition received little support even in his day.

In recapitulating the work of Patrin, J. Girardin added this remark, "Cette hypothese, ridicule d'un bout a l'autre, semble etre le produit d'un cerveau d'erange." (6) In English we would say that unfortunately Patrin was of a flighty disposition.

The isolation of metallic potassium and sodium was one of the outstanding scientific events of the 19th century and the great chemist Humphry Davy who performed the feat was not long in turning the discovery into an explanation of volcanic activity. (7) Davy regarded volcanic eruptions as the result of the action of the sea and the air on the alkali metals. According to him the earth contained large caverns filled with active substances safely shut off from the oxidizing atmosphere. When water entered a violent combination would take place producing an eruption. Here again was an explanation of why the larger number of volcanoes hugged the sea coasts.

So far we have seen all conjectures were based on the supposition that the heat of a volcano was a purely local affair but meantime another school of thinkers were working on the opposite view. Davy himself a short time before his death inclined to the view of the latter school. (8)

The opinion that the interior of the earth contained a residue of its original heat was first expressed by Whiston. (9)

By Cordier volcanic phenomena was simply due to an escape of internal material due to the solidifying of the external crust of the globe. This operation would of course produce internal heat. Secondly a great pressure was produced by the rotation of the earth deviating its shape from that of a perfect sphere. This in turn would produce heat due to friction and pressure. Unfortunately his theory does not explain the geological distribution of the volcanoes. (10)

M. Armand Gautier has explained volcanic theory by the results he procured from analytical researches on the crystalline rocks. In a series of experiments he found that rocks like granite heated in a vacuum disengaged a considerable volume of gas and he concluded that in the interior of the earth the high temperature would have a like effect. It is interesting but leads us too far.

So much for the early history of Volcanology. It has only been within recent years that scientific observations of volcanoes have been made by the leading governments of the world. Kilauea in

Hawaii has been intensively studied under the auspices of the American Government since the year 1918. It is said to be an ideal location for an observatory being almost continuously but not violently active.

Within sight of Kilauea is Mauna Loa, the largest active volcano in the world, and 10,000 feet higher than Kilauea. At present it is being kept under observation by volcanologists from Kilauea observatory though a permanent observatory has long been contemplated. The American Government also has observatories situated in Alaska and at Lassen Peak in California.

The United States is not the only country in which interest has been recently awakened. New Zealand, Japan, and the Dutch East Indies are keeping close tab on their volcanoes. Vesuvius has long been studied by the scientists of Europe. On account of its readily accessible situation, frequent eruptions and rather diminutive size it has long been referred to as "the cabinet volcano." On its slopes is perched the more or less famous Royal Vesuvian Observatory which has been located there for rather more than eighty years. Near by, in Naples, is the flourishing Volcano Institute, founded in 1914 by Dr. Immanuel Friedlander. In this city is also located the administrative offices of the Section of Volcanology of the International Geodetic and Geophysical Union, a body which holds periodic meetings of volcanologists from all corners of the globe.

For those interested in this captivating subject there are several published journals. One, the Zeitschrift fur Vulkanologie is published by Dr. Friedlander at Berlin; another known as the Bulletin Volcanologique, is the official publication of the Section of Volcanology of the International Geodetic and Geophysical Union, and is published at Naples.

For the interested amateur there is an opportunity to get much first hand information on volcanology by subscribing to the Hawaiian Volcano Research Association. They publish an interesting weekly letter for $5.00 a year. Address subscriptions to the Volcano House, Hawaii.

The problems of volcanology are numerous and varied but probably the fundamental one is to safeguard human life by the prediction of eruptions. As long ago as 1914 warning was given of the outbreak of Sakurajima in Japan and as a consequence 90,000 people were removed to a place of safety. Slowly but surely we are approaching the time when all eruptions can be foretold with assurance and that surely will be a notable conquest of science.

Modern volcanologists are not at all unanimous as to what really constitutes the explanation behind the phenomena. It is held by Professor S. Arrhemius that at great depths in the earth molten rock is far above its melting point and as a result can exist only in the gaseous condition. However so far as compressibility is concerned a gas under such an enormous pressure may behave much like a rigid solid.

If water from the outer crust of the earth penetrates by osmosis, as is suggested by Professor Arrhemius, through the sea-bottom to the molten interior it will act as an acid due to the high temperature. In taking on the characteristics of an acid it decomposes the silicates of the magna. The liquid rock, expanded and rendered more fluid by the water rises in fissures, but in doing so it cools so that the water loses its power as an acid and is displaced by silicic acid. The escaping steam gives rise to the volcanic phenomena.

According to the "planetesimal theory" of Professor Chamberlin and Dr. Moulton the original heat of the earth's interior was due mostly to the compression of the growing globe by its own gravity. The heat traveling outward caused local fusion of the rocks and the fluid magna charged with various gases then rises to produce the phenomena peculiar to volcanoes.

Entirely new views of the origin of the earth's internal heat have resulted from the more or less recent discovery of radioactivity. It has been lately discovered that radium is present in all igneous rocks, and it is estimated in quantity sufficient to maintain the temperature of the earth's crust. By some it is believed that radioactivity is a sufficient source of heat to account for all volcanic phenomena but it is disputed by others.

I have tried to sketch briefly a short history of volcanology paying greatest attention to the various hypotheses that have been advanced from time to time. Of the modern hypotheses I have given

but a few hoping that if the reader be interested he will take advantage of some of the books listed in the bibliography. I would have liked to present more material but space forbids. If but one reader is induced to study and read up on the science of volcanoes I shall feel amply repaid for my labor.

Bibliography

(1) Les Volcans: Ch. Velain, I vol., Paris, 1884.

(2) Cours de Chimie: I vol., Paris, 1756, Page 149.

(3) Origine des Volcans dans l'Italie: Rodolphe De Prystanowski, I vol., Berlin, 1822.

(4) De l'origine et de la formation des volcans: dans Atti. del reale Instituto di Napoli: Melograni, Vol. I, P. 163, 1823.

(5) Journal de Physique: 1880, Paris and Nouveau Dictionnaire d'histoire naturelle, 1804, Paris.

(6) Considenations generales sur les Volcans: I vol., Rouen, 1831, Page 99.

(7) Memoir on the Phenomena of Volcanoes, read to the Royal Society of London, March 2, 1828.

(8) On the Formation of the Earth: New Edinburg Philosophical Journal, April 1830, Page 320.

(9) A New Theory of the Earth: I vol. London, 1708.

(10) Essai sur la Temperature de l'interieur de la Terre, dans les Memoires du Museum d'histoire naturelle, 8th year, t.xv 3rd book, Page 161.

(11) Text-Book of Geology: Sir A. Geikie, 1903.

(12) Geology, Processes and their Results: T. C. Chamberlin and R. D. Salisbury, 1905.

(13) For the chemistry of Volcanoes read "Data of Geochemistry", F. W. Clarke, Bull. U. S. Geological Survey, No. 330 (1908).

(14) Volcanoes and Radioactivity: C. E. Dutton, Journal of Geology, Vol. xiv, Page 259, 1906.

(15) For details of the planetesimal theory see, Geology: Earth History, Vol. II, (1906) T. C. Chamberlin and R. D. Salisbury.

(16) Volcanic Studies in Many Lands: Tempest Anderson, London, 1903. Reproductions of photographs by the author of about 100 actual objects with explanatory notes.

(17) Volcanoes: Past and Present: Edward Hull, London, 1901.

(18) Sources of Volcanic Energy: John C. Soley, G. P. Putnam's Sons, New York, 1924.

(19) Les Convulsions de l'Ecorce terrestre, Stanislas Meunier, E. Flammarion, Editeur; Paris, 1919.

E. Mitchell Gunnell, Galesburg, Ill., received his Master's degree in Mineralogy, last spring, from Washington University in St. Louis. The subject of his thesis was—"A Study of Luminescence in Minerals, with Emphasis on Photo-Luminescence."

Mr. Gunnell contributed many popular articles on Phosphorescence of Minerals to former numbers of ROCKS AND MINERALS.

* * *

Gilbert Hart, a popular contributor to ROCKS AND MINERALS and an officer in the Rocks and Minerals Association, received his Master of Science degree from St. Edward's University, Austin, Texas, May 31st.

Two Previously Undescribed Meteorites from Mexico:—By H. H. Nininger. Proceedings of the Colorado Museum of Natural History, Vol. X, No. 1, March 1931—5 pages, 7 figures.

One of the meteorites described by the author is from the State of Coahuila and is on display at the Museum of the Instituo Geologica of Mexico City. The meteorite is now known as Puente del Zacate, Dt. Monclova, Coahuila, Mexico. It is classified as a medium Octahedrite.

The other and a much larger meteorite, weighing approximately 2,893 pounds, is also on display at the museum in Mexico City. It was found in 1907 by a prospector near the village of Nativitas, and is described by the author under the name of Nativitas Tlaxcala.

Pebbles

—— *By* ——

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Division of Geology and Mineral Industries, Museum of Science and Industry, Chicago, Ill.

PEBBLES! Why talk about pebbles? To the collector, pebbles are interesting specimens because their color, shape, or perhaps the locality strikes his fancy. Or, if the collector is also a student, as most collectors are, he may collect pebbles of the different classes and types of rocks, or he may attempt to glean from them their origin and history. But to the geologist, pebbles play a very important part. It is really surprising to find that so much has been written on this subject and that much laboratory work has also been carried on to give geologists better criteria to use in the field for interpreting pebbles. Perhaps the foremost of these writers is Dr. C. K. Wentworth, Washington University, St. Louis, Missouri.

In the field a geologist or collector will first note the locality in which a loose pebble is found and then its environment: stream, field, beach, etc. Then he will study it more closely to see to what class of rocks it belongs, its mineral composition, if possible, and any other fact about it that might lead to its proper interpretation.

On the other hand, suppose the pebble, instead of lying loose, is part of a solid conglomerate. Here again he has the same facts at his disposal to elucidate the origin of the formation he is studying. The same features which explain the origin of a pebble on a beach will in turn tell something about the "paleo-environment" in which the rock was first laid down as a sediment. It might also indicate the history of the region, pointing out periods of glaciation, exposure to the atmosphere, running water and the direction of same, or it may show that the region has been covered by a deep body of water, or any combination of these.

So it is of some interest to scientists or collectors to inspect a pebble carefully and to explain its origin as best he can. What are some of the features which can be so used?

A pebble may be considered as a transitory product of rock decay. When a rock mass is exposed to the atmosphere, it is attacked by chemical and mechanical agents which tend to break it down into fragments. Rain, frost, heat, wind, and even plants and animals in one way or another unite to produce decay and the ultimate disruption of the rocks into gravel, sand and mud.

When a ledge is so attacked, it first breaks down into large boulders or pebbles, the shapes of which are usually determined by primary characteristics, such as fractures, cleavages, hardness, brittleness, solubility, etc. In normal procedure they form talus at the foot of a cliff or lie in situ on the surface of the decaying rock. From this mass of fragments the pebbles found in stream beds or on beaches are derived. The shape when later found depends on what has happened to them since their disruption from the mother rock. The features they then possess are secondary.

Any pebble found away from its source has been transported, and it is during this movement that most of the shaping of pebbles is done. They may be moved by ice, running water, or wind, or by all of them, but each of these agents leaves a distinguishing impression upon the object being moved. Ice may scratch and groove a pebble and leave it with a highly polished surface, and the extent of scratching or polishing of course will depend on the distance it has moved from its source. Running water may round a pebble like a marble, wearing down all the rough edges and corners, or it may flatten it out like a silver dollar, or it may leave a pebble in an ellipsoidal shape. The shape in any case depends upon the primary features and upon the method of transportation, whether carried in rapid or sluggish streams, etc. But the effect of wind transportation differs considerably from that of ice or

water and is interesting and worthwhile to notice.

The effect of the wind in shaping pebbles may be best compared to sandblasting in a shop. In the latter a strong current of air is fed with sand and directed on a surface desired to be smoothed or polished. In nature the compressed air is replaced by wind and the sand feed is plentifully supplied from the ground, especially in desert regions. The main difference between the two is the time element.

Stones that are exposed to attack by the wind are abraded to faceted forms, just as a diamond, cut by a jeweler has facets. Pebbles thus formed are known by various names, such as sand blasted pebbles, dreikanter, einkanter and glyptoliths. The first and last of these are merely terms for stones that have been shaped down or carved by the wind, while the other two are used more specifically.

Johannes Walther has described wind-carved pebbles from the Libyan desert as "Einkanter," Irregular "Windkanter," "Dreikanter," and "Parallelkanter." All of these terms apply to pebbles formed by wind blowing in one direction only. The einkanter are so arranged that their single wind-cut faces lie at right angles and inclined toward the direction of the wind. With the others the pebble has been shifted about during the process of carving so that more than one face has been cut and the faces are usually at sharp angles to each other. Thus the dreikanter is a wind carved pebble having three such surfaces.

The pebbles, described elsewhere in this issue, donated to the Chicago Museum of Science and Industry by Dr. Kirk Bryan of Harvard University, are of this last-described variety. It should be kept clearly in mind that since their smooth faces are due to wind action, they prove that the pebbles have at some time been exposed to eolian abrasion, though they may later be deposited under water and buried with pebbles of different origin.

MINERAL LOCALITIES INFORMATION DEPARTMENT

Members desiring information regarding minerals or mineral localities in the following states may obtain it by writing to the Collectors listed and enclosing a self-addressed stamped envelope.

Oregon, Southern Idaho, Northern Nevada	Dr. Henry C. Dake, 793½ Thurman Street, Portland, Ore.
The Oregon Coast, South and Western Oregon, Northern California, Southern Washington	John M. Tracy, 601 Orange Street, Portland, Ore.
Petrological Information in Central Eastern Iowa	Prof. Wm. J. H. Knappe, Curator, Wartburg College Museum, Clinton, Iowa.
Massachusetts	Edward C. Foster, Department of Geology, Clark University, Worcester, Mass.
Pacific Southwest, especially Southern and Central California	Edwin V. Van Amringe, Department of Geology, Pasadena Junior College, Pasadena, Calif.

A Trip to South Death Valley Nitrate Fields

By

W. SCOTT LEWIS

In the latter part of March, 1931, the writer made a short collecting trip with a group of young people to the nitrate fields in South Death Valley, California. A drive of over 200 miles from Hollywood, nearly all over paved roads, took us to the deserted mining town of Silver Lake in the heart of the Mojave Desert. Here we stopped for the night so as to visit some abandoned mines where we obtained handsome specimens of copper carbonate.

The next day we drove on over what an auto club map assured us was a road. The distance recorded by the speedometer was not great but I am sure this would have been materially increased if we could have added the amount traveled when the car was in the air!

Camp was made at the point where the Amargosa River cuts through the end of the Ibex Mountains and enters South Death Valley. The Amargosa is one of the world's strangest rivers—a stream of pure brine flowing upside down. The water is only in sight when forced to the surface by a ledge of rocks.

As it was too late to visit the nitrate fields that day we spent the time exploring among the Ibex Mountains. At this point they are composed of marble, slate, and pink quartzite, probably of Cambrian age. Many extremely interesting sand eroded slate specimens were obtained in which each layer was etched out in strong relief.

Crossing a pass of rose-colored quartzite we saw in the distance mountains of sand and the young folks insisted on visiting them so they could "go in swimming." Sand swimming is one of the sports these young "desert rats" love best. Taking off their clothes they dive head first from the top of a sand hill down the steepest slope and with a few strokes of their arms shoot all the way to the bottom. This wind-blown sand is almost unbelievably soft and fairly car-

The Niter Hills, South Death Valley, California.

An outcropping of Caliche in South Death Valley.

esses one as you slide through it. So fascinating was this sport that no attention was paid to time and it was fortunate there was a good moon for the long walk back to camp.

The next day we hiked acoss the desert to the nitrate fields which could be seen extending in a broad band of white and yellow along the base of the mountains. The slope up to them seemed gentle and smooth from a distance but proved to be a succession of deep gullies torn out of the alluvial fan by cloudbursts. The heat was intense, although it was so early in the season, and of course there was no shade. It was difficult, tiresome work, climbing down one precipitous bank and up another all the forenoon, but finally we arrived and found our efforts well worth while.

The niter hills are curiously eroded forms, practically barren of vegetation. The nitrate values are contained in a white, cemented material known as "caliche," its South American name. It has been derived from the decomposition of the bed rock and forms a layer a little ways under the surface. In places it is soft, but usually it is a hard substance, very white and with a somewhat soapy feel. The percentage of nitrate (NO_3) present runs up to nearly 10 per cent. Unfortunately the deposits, while extensive, are superficial and it is doubtful if they will prove of any great commercial value, located as they are in a remote region where summer temperatures are nearly equal to Death Valley, perhaps the hottest place on the earth's surface.

Realizing that caliche is extremely rare in collections, every one took as many specimens as they could carry. Fortunately the return to camp averaged down grade, but even so it was surprising how much that rock weighed before we got there!

The Sluice Box

By

A. RIFFLE

Thanks to the unselfish endeavor of the Editor, we have another volume of ROCKS AND MINERALS for our files. Have you ever stopped to consider what splendid numbers the last four issues were? There is no specialized collector's field that I know of which has a magazine superior to ROCKS AND MINERALS and only a few that come anywhere near equaling it. I will ask you—Are you doing your share to increase the circulation and the advertising income of ROCKS AND MINERALS? A little reflection will show you that whatever there is of profit in this magazine comes to us in the form of enjoyment and instruction and not to the Editor in dividends. Along with the pleasure we receive from ROCKS AND MINERALS let us shoulder some of the responsibility. The next few months are "Open Season" on subscribers. An interest in the development of this magazine is all the license you need, so "bag the limit."

Old Bill is a real, live, old-time, Western prospector. Aged, but with a mind as keen as freshly flaked obsidian, and a personality as interesting as a complicated crystal. Thousands of feet of hand drilled tunnels and shafts in these mountains bear witness to the activities of his younger days. Now age has withered the strength of his arms but his mind is still a storehouse of information, philosophy and wit. He is a bit old-fashioned though and civilization is moving in on him a little too close for what he considers as his comfort. Some years ago the State put a motor highway in front of his home; later a high tension line was strung above it; and now the natural gas people are putting down a pipe line in back of it. Old Bill is viewing these developments with alarm. Yesterday he said to me, "I guess I'll have to spend the rest of my years inside the house because now if I step outside I'm taking chances on getting run over, electrocuted or blown up with a gas explosion."

"Death Valley Days"

We are sure readers, and especially those interested in thrilling and romantic adventures of miners and prospectors, will want to "listen in" to a series of very interesting and entertaining programs, sponsored by the manufacturers of the famous 20 Mule Team brand of "pure" Borax. The programs are "on the air" every Tuesday night from 9:30 to 10 P. M. Eastern Time, and 8:30 to 9 P. M., Central Time, on the vast network of powerful radio stations.

WJZ New York
WBZA Boston
WBZ Springfield
WBAL Baltimore
WHAM Rochester
WGAR Cleveland
KDKA Pittsburgh
WCKY Cincinnati
WENR Chicago
KWK St. Louis
WREN Kansas City
WJAX Jacksonville
WIOD Miami
WRVA Richmond
WPTF Raleigh
WFLA St. Petersburg

As to the programs, they are written by Miss Ruth Cornwall of the McCann-Erickson Advertising Agency. At the beginning of the radio campaign Miss Cornwall spent several weeks in Death Valley gathering material and local color for the programs. She visited and went around with some of the old-time prospectors and railroad men and thus obtained much of her material from them. Most of the stories are founded on actual incidents of the old mining days when the Company was actually bringing borax out of the Valley with the 20 Mule Team outfits.

Since the days of '49 prospectors have been tapping the hills around Death Valley for treasure. Gold has been the chief lure, but there is a variety of mineral wealth distributed through that part of the country. There are valuable salts —borax, soda, gypsum, potash and the nitrates. There are building materials —marble, onyx, brick clays. The baser metals—copper, iron and lead. The ems, turquoise, opal, tourmaline and the rarer garnets. The wealth of the Death Valley mountains has scarcely been scratched.

Today you will find few prospectors "jack assin'" through Death Valley. They travel in the modern method in strange contraptions of tin which they dignify by the name of automobiles.

These prospectors looking for "pay dirt" are not much concerned with scientific geology. As one old prospector remarked recently, "Geologists has got a name for every rock—surprising names. They know a lot about rocks, but do geologists ever find a gold mine? They don't. And you know, even if you don't know the names of the rocks, findin' gold is kinda important."

Perhaps the old prospector is right. Even so, Death Valley has always had and always will have a tremendous attraction for geologists and scientists. Dabblers in geology are dumbfounded and humbled by it all. To students of geology, the Valley is a great laboratory in which their knowledge of geologic form is sternly tested. To the true geologist, Death Valley is a paradise.

For many years now geologists have been piecing together the story of the Valley's creation, toiling through its mountain ranges, probing its lake beds, studying its composition and formation. Slowly and with great wealth of detail, geologists have reconstructed the history of Death Valley. The completed story of the geologists substantiates a tale that the Indians of Death Valley have been telling each other for a thousand years. The Indian legend has to do with angry gods who punished the mortals of that country with volcanoes, floods and earthquakes. The Indians couldn't possibly have been there when the earth was in labor, millions of years ago, but in the mysterious way of the primitive, the Indian knew all about it before the geologist proved it in scientific knowledge.

To the average person not interested in digging up gold, or scientific information, the rocks of Death Valley are well worth a visit for scenic beauty alone. Death Valley—once shunned and feared by all but a few daring souls—has now become a part of America that should be "seen first", with a tourist season, motor

Courtesy of Pacific Coast Borax Co.
Prospector and burro in Death Valley.

roads and a modern hotel located in the heart of the desert. Artists, photographers, writers visit the Valley every year in the hopes of capturing the rugged grandeur of its scenery on canvas or in words.

Death Valley has not the stupendous and awful depth of Grand Canyon, but it exceeds it in variation of form and color. Where Grand Canyon is the product of erosion in horizontal strata, more or less homogeneous with an infinite variation of tiers of rose and cream and shining violets, Death Valley is poured out, newly melted, in forms that seem not yet hardened and in variety of substance showing forth, a color range that makes Grand Canyon monotonous. It is this white hot plastic quality of Death Valley that places it at the other extreme from Yosemite, the gray granite cliffs of which were chilled and crystallized eons ago. The colors of Death Valley are not fixed colors. They are jewelers' colors—alive and changing their hue with every shaft of light.

Death Valley is easily reached by automobile road, or by train. The Pacific Coast Borax Company, overlords of the Valley, have built and operate a delightful hotel, Furnace Creek Inn, situated at sea level and commanding a magnificent view of the Valley. Off in the heart of the desert, which offers all possible comforts and luxuries, including an outdoor swimming pool, a palm garden filled with tropical plants and fountains, saddle horses and motors by which guests at the Inn may visit spots of historic and scenic interest.

Interesting literature, illustrated with photographs of Death Valley will be sent to those who will send the top of a Borax box addressed to the Pacific Coast Borax Company and mailed to the nearest office; 51 Madison Avenue, New York, N. Y., 2295 Lumber Street, Chicago, Illinois, or Wilmington, California.

Ward's Natural Science Establishment, Inc., Rochester, N. Y., the world's largest mineral dealers, have reorganized their business, moved into larger and more attractive quarters, and are now prepared to serve their many customers better than ever before.

"And they were stronger hands than mine
That digged the ruby from the earth
More cunning brains that made it worth
The large desire of a King."

—Kipling.

Field Museum Notes and News Items

Contributed by

THE FIELD MUSEUM OF NATURAL HISTORY

Chicago, Ill.

In a single day recently, 51,917 visitors entered the Museum. The all-time record to date was May 24, 1929, when 59,843 persons visited the Museum.

The fifteenth edition of the general guide-book to the collections in the Museum, with revisions covering all the important changes made in the exhibits during the past year, is about to be published.

Three large exhibition cases in the Department of Geology at the Museum are devoted to illustrating the uses of silica. The collection includes ornamental and gem varieties, such well-known substances as plastering and building sands, and such comparatively little known things as a flask for chemical use blown from pure melted quartz, and a specimen of smoky quartz which the Chinese make into dark spectacles.

Tracks of prehistoric reptiles found in Massachusetts are included in the paleontological collection exhibited at the Museum.

The characteristic volcanoes, plains, mountain ranges and other features of the moon are shown in their true positions and relative extent in a model of that satellite, nineteen feet in diameter—the largest model of the moon ever made—on exhibition at the Museum.

A restoration of grotesque prehistoric reptiles, including the duck-billed dinosaurs, armored dinosaurs, and bird-like dinasours, in the form of a mural painting twenty-four feet long, has just been placed on exhibition at the Museum, it was announced recently by Stephen C. Sims, director of the Museum.

The painting is a gift from Ernest R. Graham, and is one of a unit of a series of twenty-eight presented by him. It is the work of Charles R. Knight, noted artist.

The painting represents a scene on the eastern slope of the Rocky Mountains during the Age of Reptiles, some sixty million years ago, according to scientific estimates. Dominating the pictures are the common type of duck-billed dinosaurs, while not far off are seen other duck-bills of different species, known as hooded and crested dinosaurs. A little farther off appear the slender bird-like dinosaurs, resembling ostriches in appearance.

These dinosaurs ranged in size from that of a large crocodile to that of an elephant, states Prof. Elmer S. Riggs, Associate Curator of Paleontology. They flourished in North America at a period when the great plains area had recently been raised above the sea, when the Rocky Mountains were new, and when the whole continent enjoyed a semi-tropical climate. Their characteristics have been learned from fossil remains which have been found from Colorado to Alberta.

An expedition to collect mammals of Miocene age (nineteen to twenty-three million years ago) in various parts of Nebraska left Chicago, June 6th, on behalf of the Museum.

Prof. Elmer S. Riggs, Associate Curator of Paleontology at the Museum, is the leader. Other members of the museum staff in the party are Bryan Patterson, James Quinn, and Sven Dorf.

The expedition is being conducted under the financial sponsorship of Marshall Field of New York, a Trustee of the Museum. Localities never before inves-

tigated by a Field Museum expedition will be the scene of operations, and it is expected that specimens of a number of animals not yet represented in the Museum's collections will be excavated.

An exhibit illustrating a quick method of testing minerals for radium as well as showing the relative radioactivity of different mineral species, has been installed in the Department of Geology at the Museum. The test for radium was made by Dr. Oliver C. Farrington, Curator of Geology, by placing a small metallic object, such as a flat key, upon an unexposed photographic plate, and laying the specimen to be tested upon the metallic object. The whole was kept in a dark place for a day or so and the plate was then developed. If the rock or mineral contains radium, the rays from the radium produce an image of the metallic object on the plate, which is then developed by the usual photographic methods.

All the principal minerals which are used as commercial sources of radium are included in the exhibit. Of these, the most important are those from the Belgian Congo. These are so rich that at present, according to Dr. Farrington, they have superseded all others. Two specimens of pitchblende, the mineral from which radium was first extracted, are shown, one from Bohemia, this being the ore which was used by Dr. and Mme. Curie in their discovery of radium, the other from Colorado.

The largest stone meteorite ever found anywhere in the world, weighing approximately 1,200 pounds, is on exhibition in the Department of Geology at the Museum. It fell at Long Island, Kansas.

The relationship between quantities of iron ore and the amount of actual iron they contain is illustrated in a revised collection just placed on display among the economic geology exhibits at the Museum. A one-pound piece of each variety of ore is shown together with a piece of iron equal to its average iron content. In the case of the commonest ore, hematite, the iron weighs almost eleven and one-quarter ounces, or nearly three-quarters of the weight of the ore. The comparative scarcity of gold is emphasized by comparison of this with another exhibit in the same hall showing a cube of less than three-eighths inch diameter representing the entire gold content of a near-by specimen of gold ore which weighs 635 pounds and is regarded as a rich ore although the amount yields less than half an ounce of gold.

"Typical Rocks and Minerals in Illinois" is the title of an educational bulletin which has just been published by the Illinois State Geological Survey, Urbana, Illinois. The authors of the booklet are George E. Ekblaw and Don L. Carroll, regular members of the Survey staff.

The publication, which is well illustrated, summarizes geological conditions in Illinois and presents in non-technical language the origin, characteristics, uses and location of deposits of more than thirty rocks and minerals which are to be found within the State's borders. The booklet is especially adapted for use in schools.

Although it was written primarily to accompany sets of rocks and minerals which the Geological Survey is distributing to high schools throughout the State, the publication is also available to the general public. It is the third of a series of educational bulletins dealing with the geology and geologic history of Illinois. The title of Educational Series Bulletin No. 1 is "The Geologic Making of Southern Illinois." The title of the second is "The Rock River Country of Northern Illinois." Copies of all three bulletin may be secured free of charge for use in schools anywhere in the State of Illinois. They may be secured by the general public at a cost of ten cents each by addressing the Chief, State Geological Survey, Urbana, Illinois.

The Amateur Lapidary

Conducted by

J. H. HOWARD*
504 Crescent Ave., Greenville, S. C.

Amateur and professional lapidaries are cordially invited to submit contributions and so make this department of interest to all.

*Author of—*The Working of Semi-Precious Stones.* A practical guide-book written in untechnical language for those who desire to cut and polish semi-precious stones.

INTRODUCING THE DEPARTMENT

Nationalities and races may differ from each other in many respects but they are all similar in that they like beautiful things and are fond of self adornment.

The ideas of beauty vary greatly. The Caucasian woman considers a string of matched pearls about the most beautiful thing in the world. Her savage sister might think a ringlet of human teeth much more ornamental. But, civilized or savage, both men and women like to array themselves with bright colored bits of whatever material may be available.

Stone is one substance convenient to nearly all peoples. Nature, to which all men in the beginning looked for all things, is most inconstant. There is in nature, bearing and living and dying, but little permanency.

Stones are one of the most stable forms of material that nature gives us. Through many generations of man most stones are unchanging. It is most reasonable then that man should have chosen stone as the most common medium in which to express his art.

When tools were most primitive and technique largely a matter of accident, man used colorless soap stone and soft granular rocks to make his ornaments.

These were easy to shape but could not be polished.

Then man began to find brightly colored stones. Some of them were coarse and rough and some would glitter when held in the sun. He learned to rub holes in some of them and he strung them about the necks of himself and his women. Some he carried as good luck pieces and each kind of stone had some peculiar virtue. This one guarded the health, another altered the disposition of the wearer for good or evil, another protected against the evil eye, this one attracted friendly spirits and that one warded off vicious ones. There was hardly a stone that did not have a distinct protective or destructive characteristic.

Then he learned that these colored stones might be made more beautiful, the irregularities in their shape corrected and their colors brought out more forcibly, by grinding or rubbing a given stone against another of the same or greater hardness.

It was then that the lapidary was born.

He learned that nearly any stone would wear or cut soapstone, and that quartz would cut opal and that sapphire could cut quartz and finally he found a diamond with which he could cut sapphire.

The building of this experience doubtless took many thousands of years.

He has traveled a long road since that day. See the ordinary everyday brilliant cut diamond with its 58 facets, each perfectly sized and perfectly located. Or some of the museum pieces with their several hundred perfect facets.

And yet somehow we feel a genuine reverence for that pioneer who first cut a shape of rock crystal so it would glit-

ter in the sun, while the modern mechanic who is able to cut a perfect brilliant with lathes and indexed wheels and abrasive powders and electric motors, only stirs a profound respect.

The father of the "Art of the Lapidary" was dust thousands of years before history began, and hundreds of generations of lovers of this art have passed this feeling on to us almost as an instinct.

Today every woman wears a ring, always set with a stone. And men if they wear a ring at all have it set with a stone. And the necklaces and the bracelets worn by women are most valued if they are of stone.

The cutting of stone commercially has been largely mechanized. But for the interested amateur it still has all the allure it held for that first experimenter, who probably roughed out a cube.

The thrill which that first artisan got from his accomplishment may be ours today, though the way has been made much easier for us.

The object of this department is to act as a medium for the exchange of ideas and information.

Too little has been published on the technical side of cutting and polishing. And what has been published is largely for the professional.

This department is not for nor by professionals. We hope some professionals will favor us with articles, and with criticisms of the articles we amateurs may write. We hope they will set us aright if we make errors and that they will show us ways to improve our technique.

But it is primarily on you amateurs that we depend. Write us of your experiences. Right now we need articles on the details of faceting. How many operations do you use and what abrasive and what lap do you use on each operation? Have you had any experience with a lathe for faceting?

How do you drill your pendants and beads? Do you make or buy your index wheels? What cement do you use for holding stones for facet cutting?

If a stone breaks loose during cutting how do you manage to re-cement it so as to be sure it is set on the stick at exactly the right angle?

How do you most easily convert a slab into beads? What kind of jig do you use for drilling and what kind of jig for sawing the blocks from the slab? What kind of rig is best to use for rounding them?

Who of you has done carving and engraving of stone?

You probably had a hard time learning the answers to the above, and a thousand other questions we could ask.

Pass the dope along and make the road a little easier for the other fellow. Perhaps he in turn may be able to help you.

There are about 1500 mineral species but only about one hundred are classed as gems.

The carbon diamond is in general the most valuable.

The silicates provide the greater number of stones and include beryl, topaz, tourmaline and feldspar. Ruby, sapphire, quartz and opal are oxides.

Phosphates give us turquoise and variscite.

Sulphides, sulphates and carbonates are of minor importance as gem stones.

The Lapidary is not directly concerned with crystals but they must be of interest to everyone as one of nature's most striking displays. They range in size from microscopic to the spodumenes which grow 40' long.

In complexity they range from the simple cube to eglestonite with 482 distinct facets.

H. Michel lists the following colors and elements that impart them:

Chromium: green, violet, red, yellow.
Titanium: violet, blue, yellow, red, brown.
Iron: green, red, brown, yellow, blue, **black.**
Manganese: red, rose, violet.
Cobalt: blue, red.
Nickel: green.
Copper: red, blue, green.
Uranium: greenish yellow, orange, yellow.
Vanadium: yellow, red, brown.
Molybdenum: yellow, red.

Pleochroism is that property of a crystal which causes it to show different colors or different intensities of the same color when viewed in different directions.

It is an important property of some gem stones.

Club and Society Notes

NEW YORK STATE GEOLOGICAL ASSOCIATION MEETING 1931

The meeting took place at Port Henry, N. Y. on May 15th and 16th under the guidance of Dr. Eaton of Elmira College and was attended by more than a hundred geologists and students of geology representing almost all parts of the state.

On Friday, May 15th, the members met at Fort Ticonderoga and listened to a short explanation of glacial features of the area by Mr. Barker. The party then proceeded to Fort Crown Point, and Dr. Ruedemann of the New York State Museum discussed the early Paleozoic formations, and an opportunity was given for collecting fossils.

Members of New York State Geological Association studying Paleozoic formations near Ft. Ticonderoga.

On Saturday, May 16th, through the courtesy of the Witherbee Sherman Co., the party was conducted through one of the iron mines at Mineville, and collected many specimens of magnetite, fluorite, and other minerals. An opportunity was given to inspect the concentrating plant, where magnetic methods are used to separate the ore from the gangue.

New York State Geological Association Meeting. Columbia University Group.

In the afternoon many of the members went to the old graphite mine at Graphite. This is no longer in operation, but it was possible to collect many specimens.

This concluded the regular meeting, but on the following day some of the party went to the Barton Garnet Mine at North Creek. This is in operation and afforded specimens of huge garnets, and hornblende.

The meeting was well attended and highly successful.

SOUTHERN CALIFORNIA MINERALOGICAL SOCIETY

It is a pleasure to announce the formation of another mineral club—the Southern California Mineralogical Society of Pasadena, Calif., which held its first meeting June 23rd in the lecture room of the Pasadena library. Forty-two people attended the opening meeting and all seemed keenly interested in becoming members.

A special feature of the meeting was a talk by Edwin V. Van Amringe, of the Department of Geology, Pasadena Junior College, whose subject was, "Mineral Collecting as a Hobby." He outlined the reasons for collecting and methods of gathering and preparing specimens for display, mentioned nearby localities worthy of visits, and gave a list of good

books on minerals for amateur collectors.

The following officers were elected:

President—John A. Renshaw, Arcadia.

Vice-President—W. S. Morton, Pasadena.

Secretary—Edwin V. Van Amringe, Pasadena.

Treasurer—Miss Helen Fowler, South Pasadena.

No name for the new club was decided upon at the first meeting but was held over for the next meeting but it was suggested that each member bring to the meeting at least two possible names for the new organization as well as some minerals from their collection to exhibit. A committee was appointed to prepare a constitution and by-laws.

The second meeting of the new organization was held on July 7th in the Pasadena Library with sixty people present. The chief feature of this meeting was the selection of the official name of the club—Southern California Mineralogical Society.

No meetings of the Society were held during August but beginning with September a series of interesting programs for the fall and winter months will be inaugurated. A number of men, prominent in mineralogical circles, have also been approached and induced to deliver talks and lectures on minerals before the members.

SOUTHERN APPALACHIAN MINERAL SOCIETY

This society was organized in May of this year at the home of Mr. Burnham S. Colburn, of Biltmore, N. C. At the first meeting, 35 men were present and they organized under the name of the Southern Appalachian Mineral Society electing the following officers and directors:

President: Burnham S. Colburn.
Vice-Pres.: H. M. Urban.
Sec.-Treas.: J. Frazier Glenn, Jr.
Directors:—
W. Vance Brown,
B. C. Burgess,
John Davenport.

The second meeting of the new society was also held at Mr. Colburn's home on the afternoon of Saturday, June 6th at which time 56 members were present. Two papers were read at this meeting, one by V. L. Mattson, on Kyanite and the other by Dr. Henry Mace Payne, entitled "The Gold Bearing Areas of the Appalachians."

The next meeting will be held at Spruce Pine, N. C., Saturday, September 5th, at which time Dr. Waldemar T. Schaller of the U. S. Geological Survey will read a paper on the subject of pegmatite dikes.

The membership of the Society includes many individuals who are actively engaged in mining in the Southern Appalachian region, for mica, kaolin, feldspar, copper and iron. The membership to date totals approximately 100 and the official address of the Society is 421 Legal Building, Asheville, N. C.

MANY BOYS WIN IN MINERAL CONTEST

More than two thousand valuable minerals were shown to the public by the members of the Northeast Mineralogy Club, at its third annual exhibition, Wednesday, May 20th, at Philadelphia, Penn.

A feature of the evening was the contest participated in by seven groups. The following entrants placed in this order: **Showiest collection:** Breickner, Blumberg; **best labeled collection:** Graham, Wood; **best collection of local minerals:** Bradley, Fleming; **best collection of unique minerals:** Parrish, Bernheimer; **best suite of a certain mineral:** Breickner's calcite collection and Heiligman's smoky quartz and hematite group; **novice collection:** Wood, Matthy; **crystal collection:** Peak, Eichna.

Judges for the contest were Dr. Frederick Oldach, of the University of Pennsylvania; Mr. Harry Trudell and Mr. Harry Warford. All are members of the Philadelphia Mineralogical Society, of which Mr. E. H. Cienkowski, the sponsor of this outstanding club exhibit, is also a member.

Eissler, Bradley, Eichna, Fleming, and Breichner led the club in the mineral identification contest, and all received prizes at the meeting of the Philadelphia Mineralogical Society, May 21st.

Interesting Localities and How to Reach Them

Josephine Creek, Oregon

—*By*—

FRED W. SCHMELTZ

New York, N. Y.

This is the one locality in the world for josephinite nuggets and is located in Josephine County, Oregon. The nearest town is Kirby and the only means of travel from Kirby to the locality is over trails some three miles long. The nuggets are apt to be found most anywhere along the creek but it is preferable to have a guide from town. The best way to collect josephinite is by panning the dirt and gravel; an average of two nuggets over ½ inch long (smaller ones in proportionally large amounts) were obtained per pan on my recent visit to the locality.

This region was once the scene of active placer mining, chiefly for gold, though platinum, iridium and osmium were also found. The principal rock in the district is serpentine, from light to very dark green in color.

A Placer Mine on Josephine Creek, Oregon. Gravels are being reworked.

Editor's note:—This is the first of a series of little notes on some interesting localities of the West visited by Mr. Schmeltz during the early months of 1931.

In addition to the notes, a large number of new subscriptions, pictures, minerals and other remembrances of the trip were donated to us by Mr. Schmeltz as an expression of his interest in the magazine and what we are trying to accomplish. This kind thoughtfulness of our endeavors is gratefully appreciated.

Gems of the Southwest

— *By* —

NELL LOUNSBERRY

SERPENTINE

The history of serpentine dates back nearly 6000 years, when cylindrical seals were first carved from rock by the ancient Babylonians. At that time, methods for cutting and engraving were primitive at the best and only the easier worked of materials could be used—consequently they employed soft serpentine. As time went on and engraving tools were perfected by the addition of corundum and diamond points, the harder serpentines came into use and gradually other precious stones and metals.

In the J. Pierpont Morgan collection is a seal of green serpentine which dates back to 2450 B. C. and upon which is graven the name of Gudea, at that time ruler of Lagash. Together with his name is the inscription, "Abba The Scribe—Thy Servant". Thus, at one operation the names of both the king and his secretary were affixed to the royal documents and writings. Another royal seal in the Morgan collection is of black serpentine and engraved with the name of Ine Sin-King of Ur some twenty-eight centuries B. C. On the seal he styles himself, "Servant of the God Adar".

The mineral, serpentine, is abundant and of wide distribution, the finest deposits being located in California, New Mexico, Washington and Maryland, as well as England and Ireland. Some of the species are highly prized for their rich yellow, brown and black colors, while others are beautifully mottled with red. However, the usual color of precious serpentine is a rich dark, or pale green.

There are many types and variations, the differences being based chiefly upon structure. One variety known as Williamsite is apple-green, hard and translucent, while the very pale green variety known as chrysotile is silky textured and flexible, it being possible to separate the fibers with the fingers. No other mineral varies so greatly in hardness. The type picrolite grades 2 and may be scratched by the finger-nail, while bowenite ranges as high as 6 and will scratch glass. Specific gravity ranges from 2.14 to 2.80.

Serpentine is chiefly composed of hydrated silicate of magnesia and may contain small quantities of secondary minerals such as chromite, garnet, etc. Veins of calcite often intersect the serpentine in all directions, producing a most striking effect. It is often more or less mixed with limestone or magnetite, these minerals giving the mass a clouded or veined appearance. One specimen in the writer's collection, from Quartz Creek, Malheur County, Oregon, exhibits these veined markings most noticeably, the green foundation being interwoven with black, fern-like designs.

It occurs in masses of enormous proportions, and in that form only—never as crystals.

Serpentine is used considerably for gem stones, especially the Williamsite type. Some authorities even list it as the semi-precious birthstone for October, others declaring this to be false and favoring beryl instead. It is also used largely in place of jasper and marble for interior decorating and is sometimes turned out on the lathe for vases. Many buildings in Philadelphia and other large eastern cities are constructed of a cheap green serpentine from the quarries at West Chester, Pa.

Our Junior Collectors

Some Day They May Be Our Leading Mineralogists

Fred Low (left) and Dr. H. C. Dake, President of the Rocks and Minerals Association (right).

Fred Low, of Los Angeles, one of our most enterprising and enthusiastic junior mineral collectors, spent the entire summer visiting mineral localities in the west. While Fred is only seventeen years of age his knowledge of minerals is remarkable and a constant source of amazement to the adult collectors whom have had the pleasure of meeting Fred personally.

This enterprising boy traveled many thousands of miles alone, in an ancient but faithful model "T", paying his expenses by selling some of the minerals which he collected to the collectors he met enroute. Fred says the hardest part of the entire tour was the two weeks spent in the Death Valley region, when on one occasion his water supply was almost exhausted.

Fred visited many of the best known localities in California, Oregon, Idaho, Utah, and Colorado, and saw most of the mineral collections of the state universities as well as many private collections.

Dr. Henry C. Dake, of Portland, Oregon, and President of the Rocks and Minerals Association, recently exhibited a large part of his very fine collection in the public library of his city. The exhibit created considerable interest and favorable comment and thousands of visitors stopped to see and admire the many choice specimens on display. The exhibit was to be on display for three weeks but it was extended to seven weeks, so keen was the interest shown by the general public.

Copies of ROCKS AND MINERALS were prominently displayed with the exhibit and Dr. Dake received many calls from interested people who wished to know more about the magazine.

The exhibit was given much publicity by the local press.

Bibliographical Notes

Handbook for Prospectors:—By M. W. von Bernewitz, Mining and Metallurgical Engineer. Second Edition, revised and enlarged—359 pages, 89 illustrations. Published by the McGraw-Hill Book Co. Inc., 370 Seventh Ave., New York, N. Y., Price $3.00.

A recognized authority on prospecting from its very first issue in 1926, the appearance of the second edition—revised and enlarged—is evidence of its popularity among engineers in general and prospectors in particular. Written by an engineer who has had 30 years of prospecting experience in this and in many foreign countries and planned as a complete modern guidebook for mining engineers engaged in field work, the volume covers the subject extremely well in simple and concise language. The equipment of an engineer or prospector is not complete if a copy of this volume does not appear.

The Grootfontein, Southwest Africa, Meteoric Iron:—By Samuel G. Gordon. Proceedings of the Academy of Natural Sciences of Philadelphia, Vol. LXXXIII, 1931, pages 251-255, 3 figures. An interesting descriptive article on the largest meteorite known which was visited and examined by the author on the Fourth Academy-Vaux Mineralogical Expedition, in December, 1929.

The meteorite lies on Farm Hoba, about 20 kilometers west of Grootfontein, in Southwest Africa. When first discovered (in 1920?), only a bit of the upper surface was exposed. Extensive excavations since then revealed its immense size, estimated to be 60 metric tons.

Annual report of the Minister of Mines of the Province of British Columbia for the Year ended 31st December, 1930: Being an account upon the mineral industry of the Province for 1930.—468 pages, 62 photographs, 33 plans, 2 maps. Issued by the Minister of Mines, Victoria, B. C. Canada.

1930 Year Book of the Academy of Natural Sciences of Philadelphia:—77 pages, 57 illustrations. A review of the work of the Academy during 1930. During 1930 more than 120,000 varied and interesting specimens, gathered from every land and ocean in the world, were added to the Academy's museum and scientific collections. This brings the grand total of specimens at the Academy to more than 6,000,000, ranging in size from the skeleton of a 58-foot whale to the mere dust-speck of some microscopic insect.

The Fourth Academy-Vaux Mineralogical Expedition was made to Africa under Mr. Samuel G. Gordon, Associate Curator of Mineralogy, and was highly successful as 2,276 specimens of minerals, rocks, and ores and a section of the famous iron meteorite near Grootfontein, were collected.

It is also interesting to note in the Year Book, that of the 1100 known minerals in the world, the collections in the Department of Mineralogy and Geology, represent 92 per cent of them, and include some of the finest specimens yet discovered, many of which are on exhibition in Mineral Hall. New methods of display inaugurated during 1930 have added greatly to the effectiveness of this large and beautiful showing.

Another item of interest is the Fluorescence Exhibit in Mineral Hall, most complete of its kind in the world, which has been enlarged to include a series of small shells from the China Sea, which show a deep red glow under the ultraviolet rays. The colors thus brought out in the varied specimens in this exhibit are more brilliant than ever, now that the light filter has been greatly improved by the use of Corex A Red Purple filter glass—a new kind of glass made without sand.

The Philadelphia Academy of Natural Sciences is the oldest institution of its kind in America.

THE ROCKS AND MINERALS ASSOCIATION

PEEKSKILL, N. Y., U. S. A.

Organized to stimulate public interest in geology and mineralogy and to endeavor to have courses in these subjects introduced in the curricula of the public school systems; to revive a general interest in minerals and mineral collecting; to instruct beginners as to how a collection can be made and cared for; to keep an accurate and permanent record of all mineral localities and minerals found there and to print same for distribution; to encourage the search for new minerals that have not as yet been discovered; and to endeavor to secure the practical conservation of mineral localities and unusual rock formations.

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New Members Enrolled—May 1—July 20, 1931

THE HONOR ROLL FOR 1931

New Members Secured Since January 1st, by:

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Edmund H. Cienkowski, Philadelphia, Pa.	25
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John W. Hilton, Thermal, California	10
R. J. Santschi, Glen Ellyn, Illinois	9
Ward's Natural Science Est., Rochester, N. Y.	8
James L. Riland, Meeker, Colorado	7

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Russell, George
Nogales—Spelbrink, Bernard H.

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Berkeley—Univ. of California Library
Camino—Corker, J. F.
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JUGOSLAVIA

Belgrade—Gagarine, Prince Gregoire

AFRICA

PORTUGUESE EAST AFRICA

Tete—Vaz, J. Ferraro

President's Page

—*By*—

DR. H. C. DAKE

A National Rock and Mineral

For some years past the officers of our Association and the editor of ROCKS AND MINERALS have received numerous inquiries, from our members as well as others, relative to the selection of a rock and mineral to be called "National". Many of our states have designated botanical and zoological species in a similar manner, and it seems proper that we should have a "National" rock and mineral.

Since there seems to be considerable popular interest in this matter, ROCKS AND MINERALS, the official journal of our Association, has decided to sponsor the selection of a rock and mineral, to be henceforth designated as our National ones. The selection is to be made by popular vote and is not limited to members alone. Anyone interested is invited to send in their choice. Simply fill in the ballot appearing in this issue, indicating your choice by marking one mineral and one rock.

It being obvious that a selection of this kind would be limited to a relatively few species, a number of well known mineralogists and geologists were consulted for their opinions. The choices of this group of individuals have been placed on the ballot. However it is not obligatory to vote for any of those mentioned on the ballot, if your choice does not happen to coincide with the selection of the nominating committee. Your personal choice can be written in the place upon the ballot provided for that purpose.

The results of the ballot will be published in the press as well as in our magazine, ROCKS AND MINERALS. Further announcements of this contest will appear later. Send in your ballot!